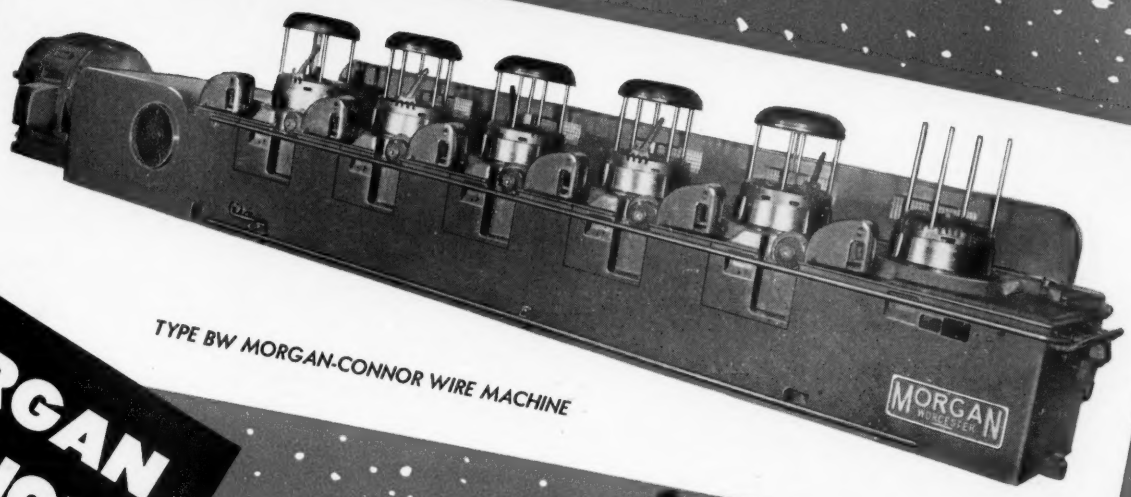
WIRE AND WIRE PRODUCTS

DECEMBER 1947



TYPE BW MORGAN-CONNOR WIRE MACHINE

MORGAN CONNOR WIRE MACHINE

RELIABILITY

FLEXIBILITY

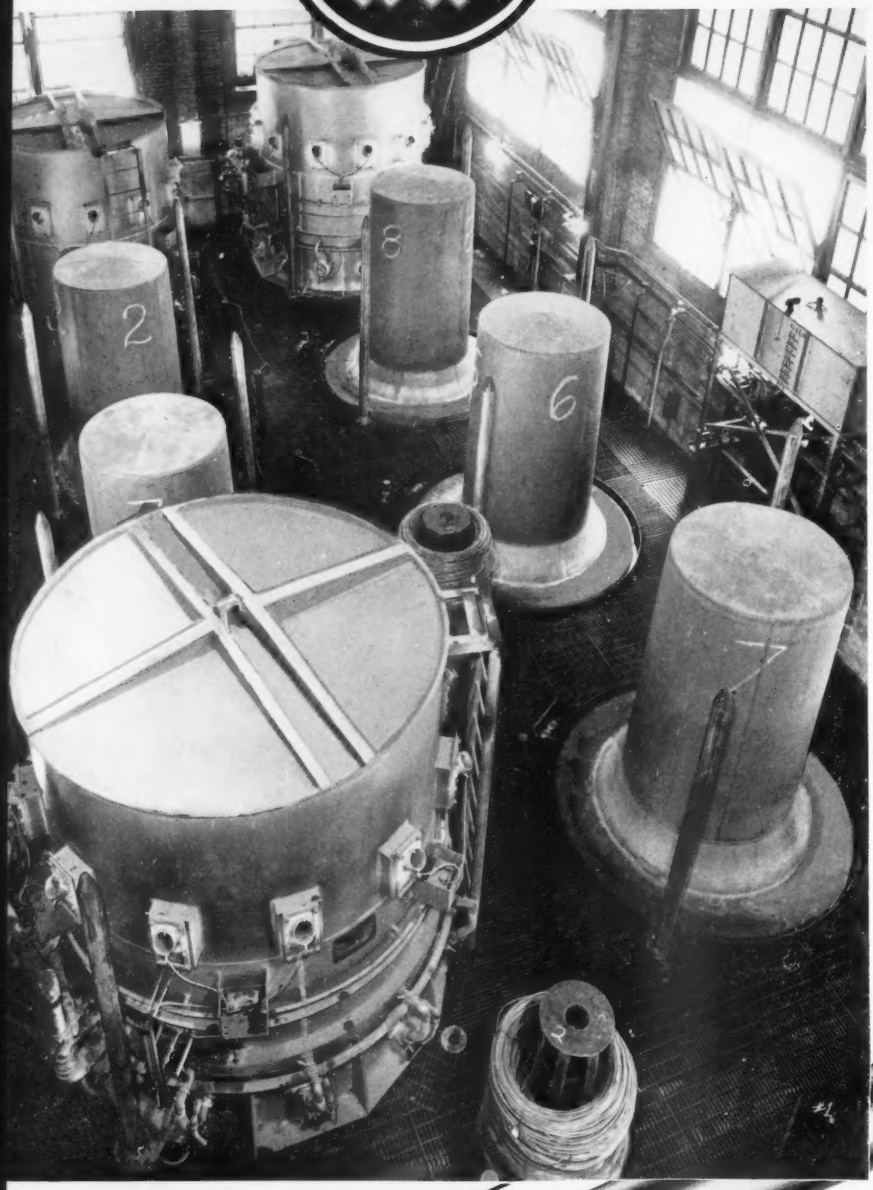
LONG LIFE

EFFICIENCY

ORGAN CONSTRUCTION CO. WORCESTER, MASS.

FICIAL PUBLICATION OF THE WIRE ASSOCIATIO

These WILSON Furnaces



anneal the wire from which the famous Reed & Prince recessed head screws and bolts are made.

"A HEAD OF THE TIMES"

TRADE MADE IN THE UNITED STATES OF AMERICA WORCESTER, MASS. MARK

ENGINEERED AND CONSTRUCTED BY THE

Lee Wilson ENGINEERING Co., Inc.

20005 West Lake Road CLEVELAND, OHIO

Telephone ACademy 4670

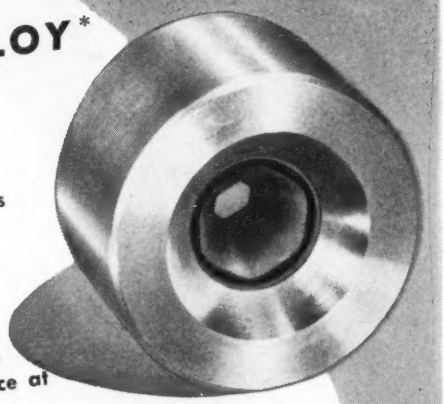
INDUSTRIAL FURNACES ★ RADIANT TUBE HEATING ★ HEAT TREATING PROCESSES

In Carbide Dies for WIRE . . . BAR . . . or TUBE DRAWING

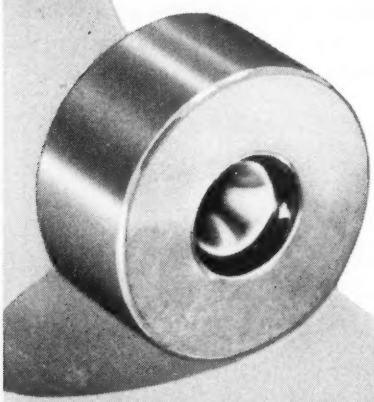
You Get MORE Benefits with CARBOLOY*

WHEN YOU SPECIFY "CARBOLOY", you get dies of dependable quality . . . dies that assure you maximum carbide benefits in terms of closer tolerances, longer runs, better finishes and more tonnage per die.

OUTSTANDING CARBOLOY FEATURES—including the exclusive forged casing to provide maximum strength . . . combine to give you lower die cost per ton . . . top quality performance at lowest cost.



For top performance, prompt delivery from local stocks, extra technical services at no extra cost . . . look into the extra benefits you get in Carboloy Dies. For expert "know-how" on Carboloy die servicing—send for the FREE 64-page Carboloy Die Service Manual D-119. Carboloy Company Inc., 11171 E. 8 Mile Street, Detroit 32, Michigan.



"Complete Package" Die Service

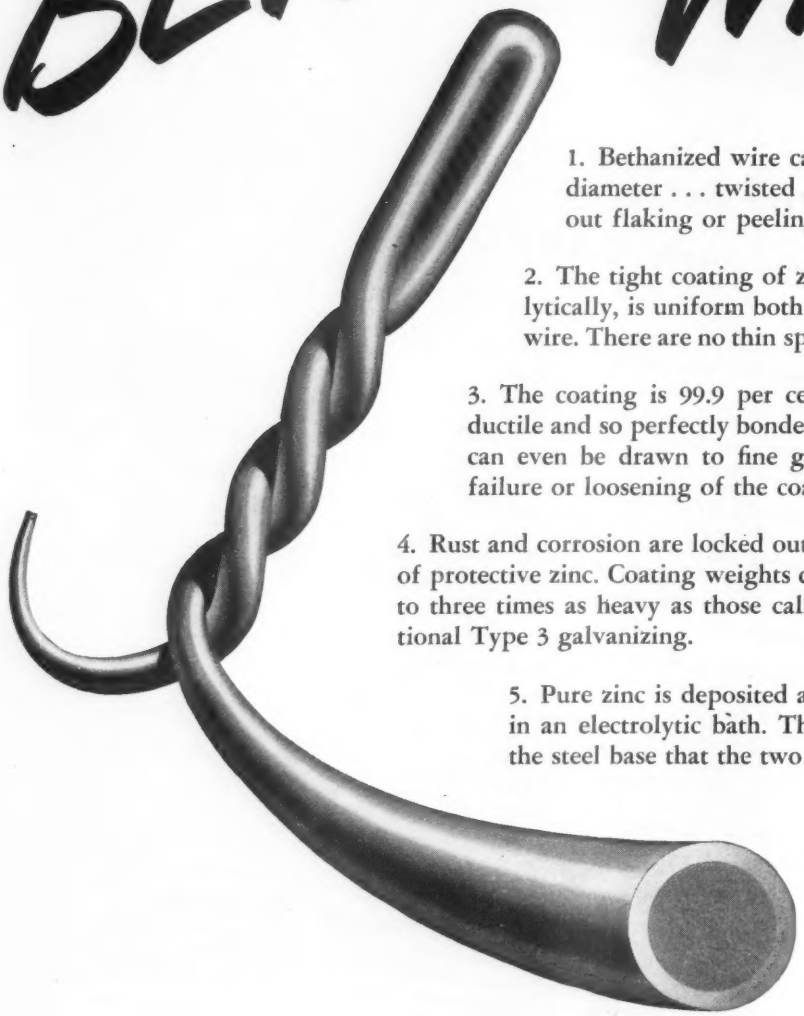
This means *extra services* for you—*at no extra cost*—when you specify Carboloy Quality Dies.

1. Conveniently located Die Service Centers and Field Engineers.
2. Local Standard Stocks in Detroit, Chicago, Los Angeles, Pittsburgh and Newark.
3. Free Training School for your Die Room Personnel.
4. Approved Die Room Equipment recommendations by Carboloy.

Complete Die Service for WIRE, BAR, TUBING and SHEET METAL

CARBOLOY* CEMENTED CARBIDES ®

IT'S BETHANIZED WIRE



1. Bethanized wire can be wrapped around its own diameter . . . twisted . . . bent flat on itself . . . without flaking or peeling of the zinc coating.

2. The tight coating of zinc, deposited electrolytically, is uniform both around and along the wire. There are no thin spots to invite corrosion.

3. The coating is 99.9 per cent pure zinc. It is so ductile and so perfectly bonded that bethanized wire can even be drawn to fine gauge without causing failure or loosening of the coating.

4. Rust and corrosion are locked out by the tight bond of protective zinc. Coating weights can be supplied up to three times as heavy as those called for in conventional Type 3 galvanizing.

5. Pure zinc is deposited atom by atom on the steel wire in an electrolytic bath. The zinc is bonded so tightly to the steel base that the two metals become practically one.

Only bethanized wire offers these unique advantages. Here's your answer to those tough forming jobs. And don't overlook its high resistance to corrosion.

Give it a thorough tryout in your own plant. There's no better way to appreciate the superiority of bethanized wire.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.

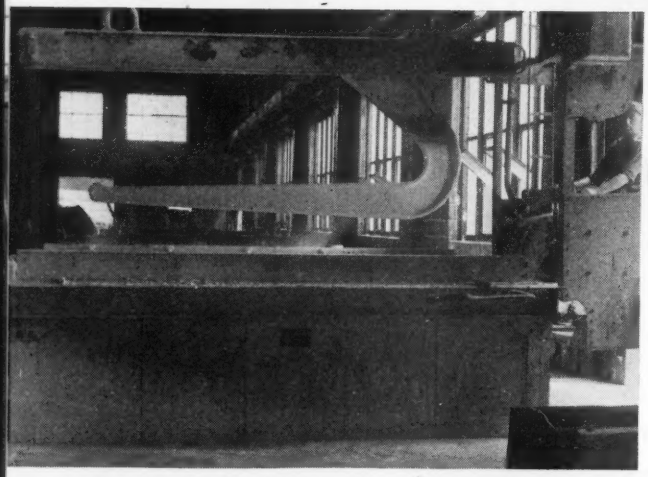
BETHLEHEM STEEL

WIRE & WIRE PRODUCTS, Vol. 22, No. 12, December, 1947. Publication Office, at 61 Cliff St., New York 7, N. Y. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S., $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, June 14, 1946, at the Post Office, New York, N. Y., under Act of March 3, 1879.

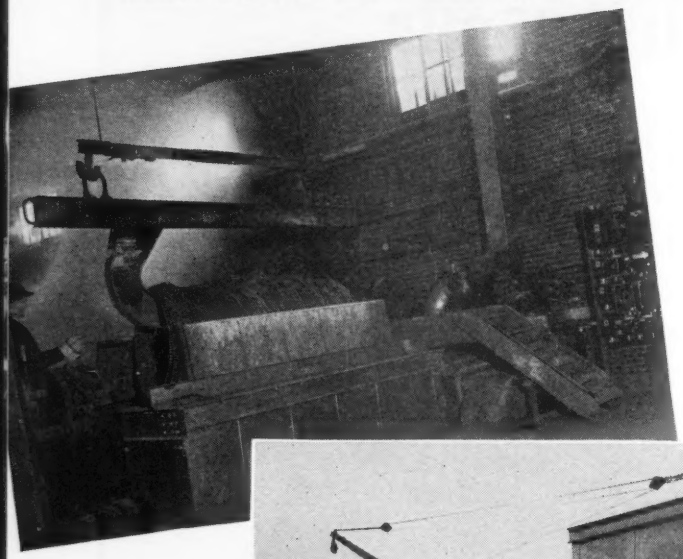
We extend to the members of the Wire Industry our sincere regards and our best wishes for The New Year

STANDARD INDUSTRIAL COMPOUNDS CO.
CHICAGO, ..ILLINOIS

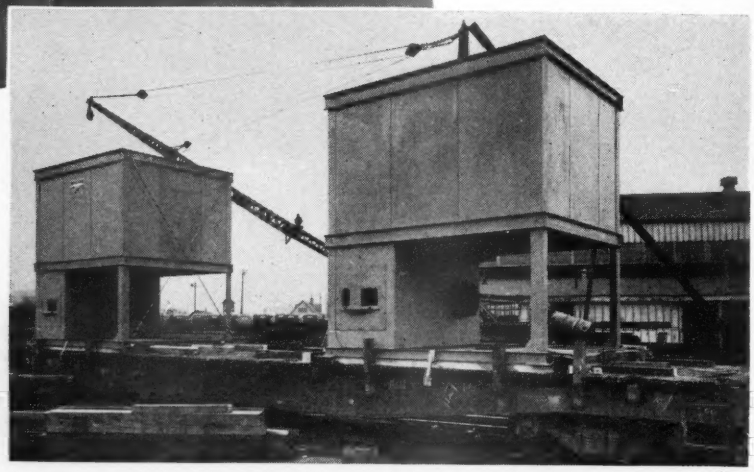
EVEN REASONS WHY You'll Profit by using the CARL-MAYER HI-SPEED REGISTERED ROD BAKER



Carl-Mayer Hi-Speed Rod Baker at Atlantic Wire Co.



Carl-Mayer Hi-Speed Rod Baker at Wickwire Spencer Steel Co.



Recent shipment of Carl-Mayer Hi-Speed Rod Bakers to large wire mill. Note compact heavy duty construction.

"CARL-MAYER" PATENTS (Rod Baker)
United States
2,296,361
2,323,828
2,235,559
Canada:
396,144
401,589

NO OTHER BAKER CAN COMPARE!

- HI-SPEED PRODUCTION. Bakes up to 4,000 # of rod per pin in 3 to 15 minutes, depending on whether high or low carbon, or up to 1,000 # fine wire in 15 minutes.
  Compare this with your present practise.
- Fuel Saving. Saves up to 40% over competitive designs due to patented self-opening and closing doors at top of baker and other features which greatly reduce heat loss.
- ELIMINATES RUSTING because of patented recirculating and blow-off system.
- SAVES SPACE. Production, as stated above, requires on the average of 150 square feet of floor space.
  Compare this with the obsolete truck type baker you may be using.
- LABOR SAVING (how essential). Crane operator handles all operations—cleaning, lime coat and bake.
  Compare this with the old conventional truck type baker.
- THE LARGEST WIRE MILLS have recently chosen Carl-Mayer Rod Bakers for the preceding reasons. Can you afford not to?
- INITIAL COST. Ask for quotation and see how reasonable the cost for the results obtained. Carl-Mayer Rod Bakers can be furnished with direct or indirect heating and for any desired fuel.

THE IMPORTANCE OF RECENT PURCHASERS *is Proof of* CARL-MAYER OUTSTANDING QUALIFICATIONS.

Typical Users Include:

★ American Steel & Wire Co. (2)
Allegheny Ludlum Steel Corp.
Atlantic Wire Co.
Atlas Steel Co.
Atlas Tack Corp.
California Wire Cloth Corp.
★ Comfort Spring Co. (1)
★ Crucible Steel Co. of America (2)
Eaton Manufacturing Co.
Frost Steel & Wire Co., Ltd.
Johnson & Nephew, Ltd.
★ Jones & Laughlin Steel Co. (4)
Pittsburgh Tool Steel & Wire Co.
★ Republic Steel Corp. (3)
Steel Co. of Canada
★ Wickwire Spencer Steel Div. of Colorado Fuel & Iron Corp.

★ *1947 INSTALLATIONS TO DATE*

Backed by a Reliable Company with More Than 28 Years Experience

THE CARL-MAYER CORPORATION

3030 Euclid Avenue ◆ Cleveland, Ohio

Get these facts about Electropolishing Stainless Steel Products

This may be an opportunity for you or your customers to cut polishing costs and give lustrous new sales appeal to stainless steel products.

This improved process — called "Armco Electropolishing" — is a low-cost way to polish many stainless steel products in one operation by anodic treatment in an electrolytic bath. Parts with tiny recesses or of intricate design cannot escape the uniform polishing action of the chemical bath.

Armco Electropolishing has shown substantial savings for fabricators of practically all forms of ARMCO Stainless Steels, including wire, bars, forgings, sheets and strip.

If You Coat Wire . . .

If you use coated wire it may pay you to investigate the possibilities of ARMCO Stainless Steel—and the Electropolishing process. Many manufacturers have cut costs and made good products better by changing over to Electropolished ARMCO Stainless Steel wire parts.

For more information about this cost-saving method of polishing stainless steels to a high luster, just fill in the handy coupon on this page. We'll send you a fact-filled folder on Armco Electropolishing titled "Polish Stainless Steels This Easy, Low-Cost Way." Mail it today! The American Rolling Mill Co., 431 Curtis St., Middletown, Ohio.

ARMCO ELECTROPOLISHING PROCESS

ARMCO

Send for this data folder

THE AMERICAN ROLLING MILL COMPANY
431 Curtis Street, Middletown, Ohio
Send me a copy of the folder titled "Polish Stainless Steels This Easy, Low-Cost Way."

Name_____ Title_____
Company_____
Street Address_____
City_____ Zone No._____ State_____

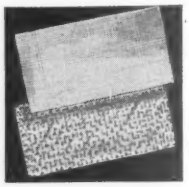
3 TAPE QUESTIONS

HOW MANY CAN YOU ANSWER?

General Electric spares no expense or effort to produce the finest cable tape obtainable. Each step in the intricate production is carefully supervised. The G.E. laboratories do your experimenting for you, and they make certain that the tape you use is the best tape for the job. General Electric emphasizes quality control. This is your assurance that all G-E cable tape is uniform and conforms to specifications. For further details write to Resin and Insulation Materials Division, Chemical Department, General Electric, Schenectady 5, N. Y.

CABLE TAPE

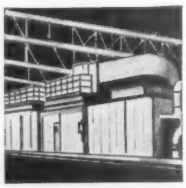
QUESTION NO. 1: How does sizing affect a cable tape's insulating qualities?



ANSWER

It affects it greatly. Too much sizing means less varnish impregnation—and it is the varnish that insulates, not the sizing. The cloth used in G-E cable tape contains just the right amount of sizing to permit maximum varnish impregnation.

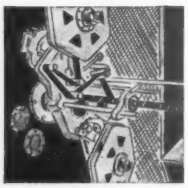
QUESTION NO. 2: What advantages are there in pre-testing cable tape?



ANSWER

Pre-testing brings to light any flaws in the cloth itself. Mechanical and dielectric strength can be accurately determined before the tape is used, and resistance to chemicals and moisture can be established to help guarantee long and efficient service life. Each lot of G-E tape is carefully pre-tested to make certain that it has all the important insulating values.

QUESTION NO. 3: How does a tape affect your cable business?



ANSWER

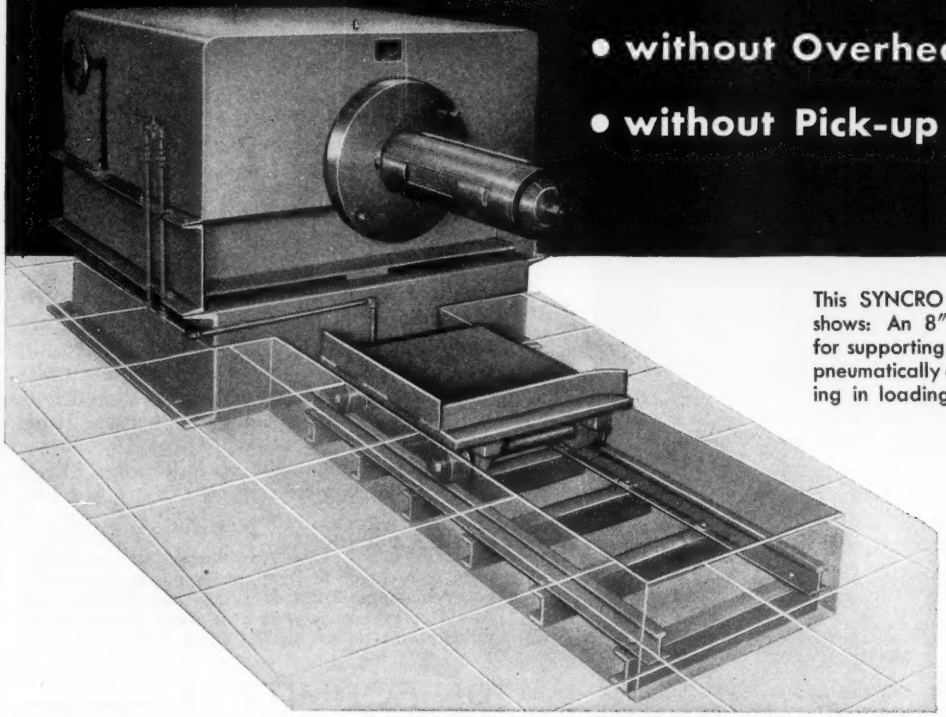
Naturally a good tape helps insure a high quality cable. G-E cable tape more than meets I. P. C. E. A. standards. It is extremely easy to apply because it is soft, pliable, and of uniform width and thickness.

GENERAL ELECTRIC

WP-12

NOW-Heavy Reels for pay-off can be loaded

- without Overhead Cranes
- without Pick-up Grapples



This SYNCRO PAY-OFF REEL STAND shows: An 8″ expanding type arbor for supporting 8″ bore reels—also the pneumatically operated dolly for assisting in loading and unloading.

Loading of reels for pay-off is not only easier but faster with the NEW SYNCRO T-2 4000# PAY-OFF REEL STAND specially designed for use with heavy duty wire drawing or other wire processing equipment.

A floor level dolly on narrow gauge rails permits reels to be rolled on it without lifting—and positions them for loading.

The dolly is air-operated—controlled by an air cock on the side of the unit.

Features of the SYNCRO PAY-OFF REEL STAND that have revolutionized the loading and paying-off of heavy reels include:

- A patented 8″ expanding type arbor
- An accessible hand wheel control for the hold back tension mechanism
- An electro-pneumatically controlled brake that initiates a pay-off stop in syncronism with the main machine

Your inquiry about this or other machinery for the Wire Industry is invited.

Machinery for the Wire Industry

1469

SYNCRO MACHINE COMPANY

611 Sayre Avenue **Perth Amboy, N. J.**

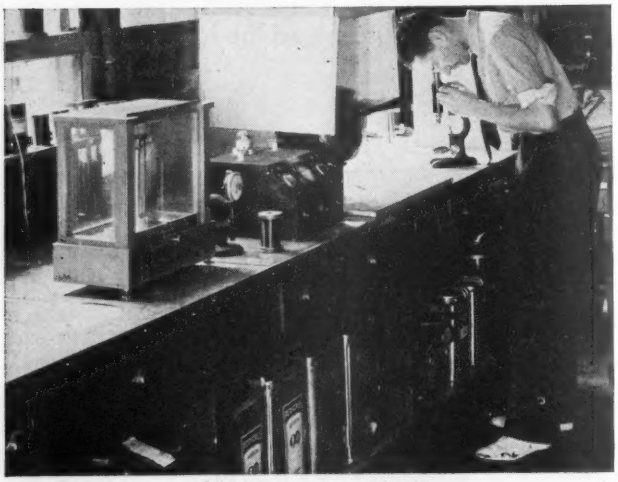
Standardize on **Syncro**

There's a standard Syncro machine for every wire drawing need, from rod to fine wire—from strands to cable.

SYNCRO

Custom built spools for high speed winding

Mercury testing for continuity of film



Checking raw materials

Don't "fool around"... USE DEPENDABLE WIRE PRODUCTS!

A product, too, is only as strong as its weakest part. Follow the practice of leading designers and engineers by specifying only service-giving wire . . . wire that has built up a reputation for "delivering the goods under fire."

Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values, Hudson Wire products will probably lower your production costs considerably. Check these three points:

QUALITY — **All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.**

UNIFORMITY — **By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.**

SERVICE — **If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.**

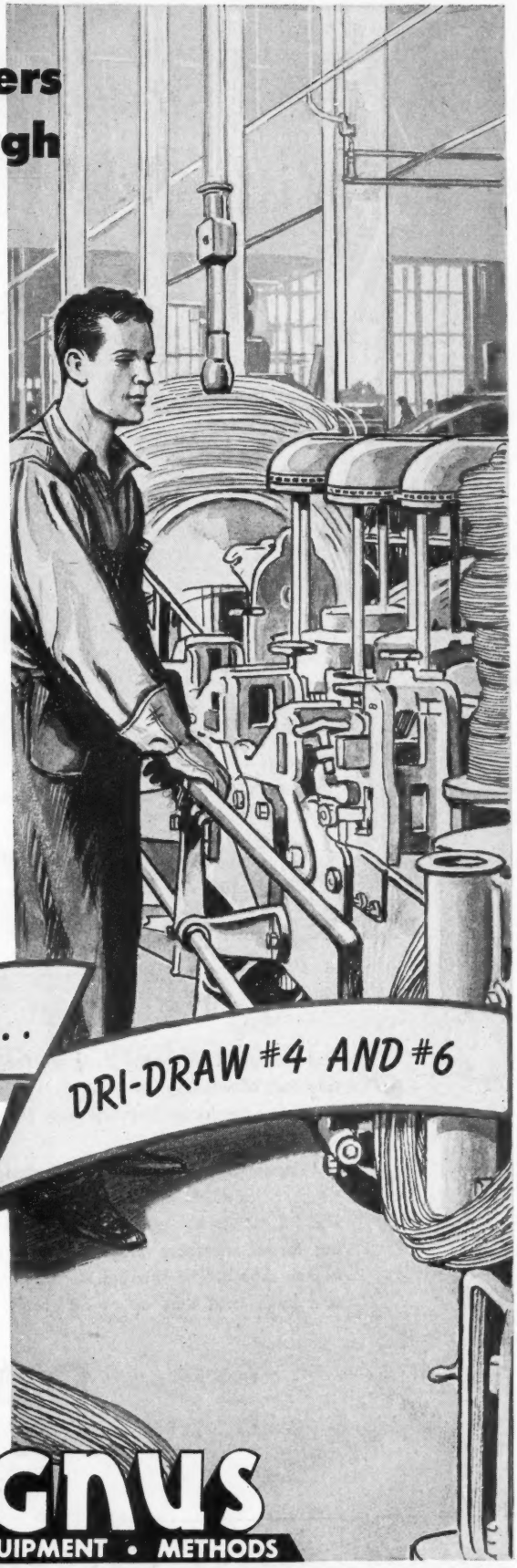
Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples, and Litzendraht

HUDSON WIRE CO.

Winsted Division

WINSTED CONNECTICUT

Two Dry Drawing Leaders With Real Follow Through



IF YOU are looking for a dry drawing compound that has excellent adhering qualities, adequate slip and unusual ability to follow the metal through the die, no matter how hard the draw, it will pay you to investigate the characteristics of

MAGNUS DRI-DRAW #4 and #6

Dri-Draw #4 is especially adapted to high carbon and stainless steel wire and for difficult draws on low carbon wire. It provides an exceptionally tenacious film of high strength, leading to minimum die wear and to a bright finish, particularly on stainless.

Dri-Draw #6 is an excellent all around dry drawing compound for operations where the special properties of Dri-Draw #4 are not essential.

As has been the case with all Magnus Wire Drawing Compounds, we have consistently maintained the quality of our products during these tough days of inadequate raw material supply. There were times when we could not fill orders because of these shortages in raw materials, but we preferred to maintain top quality rather than to stretch our supplies thin through dilution and substitution.

MAGNUS METAL COAT #267

Cuts costs by eliminating lime. It insures longer die life, better finish, fewer rejects due to scratching, much lower lubricating costs and a much easier wire to clean. Not only are the trouble, expense and mess of liming and baking ended, but the ultimate cost per ton of drawn wire will be much less than when lime was used.

FOR SUPERIOR DRY DRAWING . . . DRI-DRAW #4 AND #6

MAGNUS CHEMICAL COMPANY
188 South Ave., Garwood, N. J.
IN CANADA – MAGNUS CHEMICALS, LTD.
4040 Rue Masson, Montreal 36, Que.
Service representatives in principal cities.

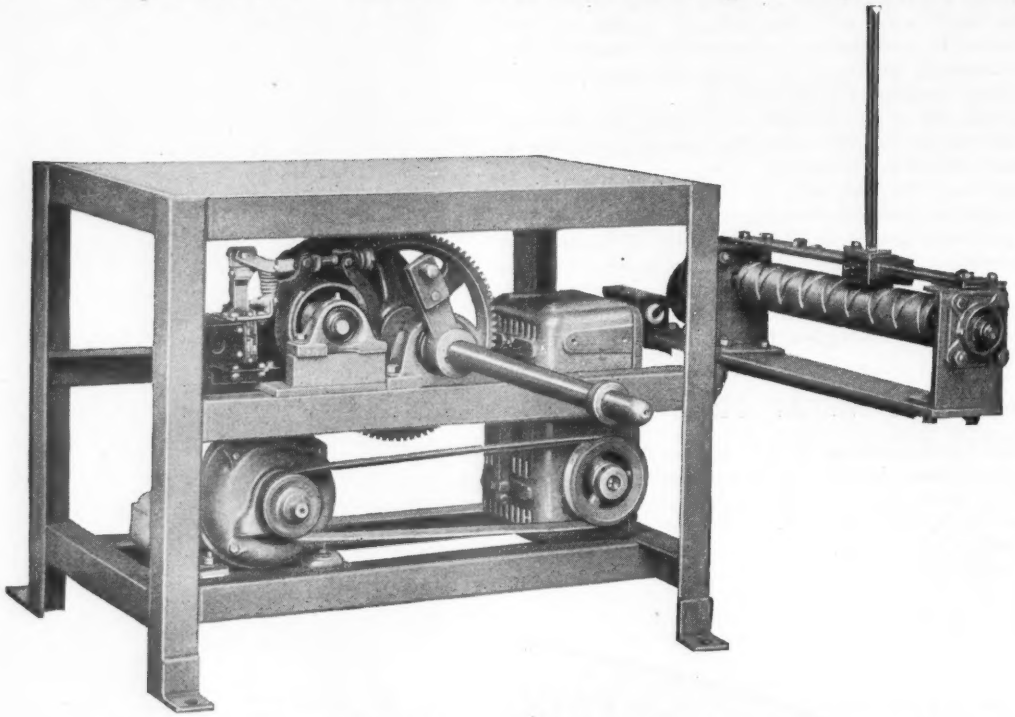
IN WIRE DRAWING IT'S

Magnus
CLEANERS • EQUIPMENT • METHODS

MAGNUS CHEMICAL COMPANY • **188 South Avenue, Garwood, N. J.**
Service Representatives in Principal Cities
IN CANADA – MAGNUS CHEMICALS, LTD., 4040 RUE MASSON, MONTREAL 36, QUE.

Variable Speed Take-Up— With Variable Traverse

Suitable For Inspection and Re-Winding Operations.



This machine is primarily designed for automatic spark testing. It also can be used for any sort of winding, particularly for inspection work, and any type of work where a variable speed and instantaneous stopping is required.

The machine consists of a poly-phase motor driving a variable speed transmission which is mounted on ball bearings, capable of running the output shaft from 50 to 750 R.P.M. On the main shaft is mounted a solenoid brake. In this manner the braking torque increases proportionately with the speed and there is more braking at higher speeds. The braking in this manner eliminates the shock on the speed reducer and belts. Will take up to 30" reels.

DAVIS

EQUIPMENT

FOR THE

WIRE INDUSTRY

SPARK TESTERS • SPOOLERS • TAKE-UPS • CAPSTANS

THE R. L. DAVIS ELECTRIC CO., INC., WALLINGFORD, CONN.

WHATEVER YOU MAKE FROM WIRE..

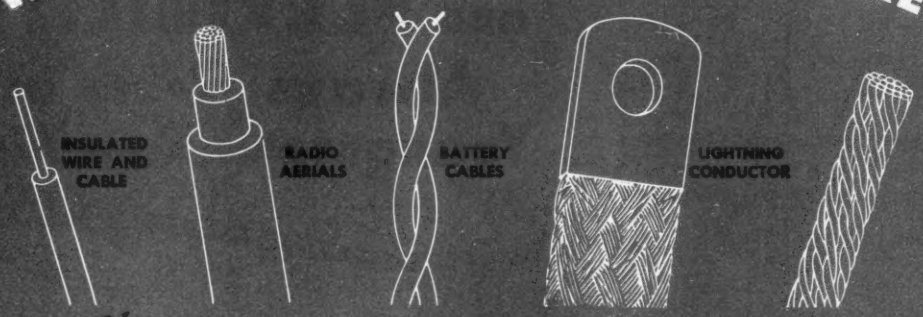


FIGURE IT IN ALUMINUM

for better products, greater sales, larger profits

ALCOA ALUMINUM

for electrical conductors

You can get Alcoa Aluminum Wire and Redraw Rod in the proper alloy and in all sizes for the fabrication of all types of electrical conductors. Use your present fabricating equipment.

Aluminum weighs only ⅓ as much as copper or steel . . . you get three times as many feet of aluminum per pound of metal. Size for size, Alcoa Aluminum Wire has 84% the current-carrying capacity of copper, yet weighs only ⅓ as much—equal conductivity at half the weight.

You can get prompt shipment of Alcoa Aluminum Wire and Rod. Telephone the nearby Alcoa sales office, or write to ALUMINUM COMPANY OF AMERICA, 1828 Gulf Building, Pittsburgh 19, Pa.

HIGH ELECTRICAL CONDUCTIVITY

. . . 84% of the current-carrying capacity of copper, size for size. Equal conductivity at half the weight.

THREE FOR ONE

. . . three times as many feet of wire in a pound of aluminum as in a pound of copper, steel, or brass, size for size.

EASY TO WORK

. . . you can handle aluminum wire on your present equipment.

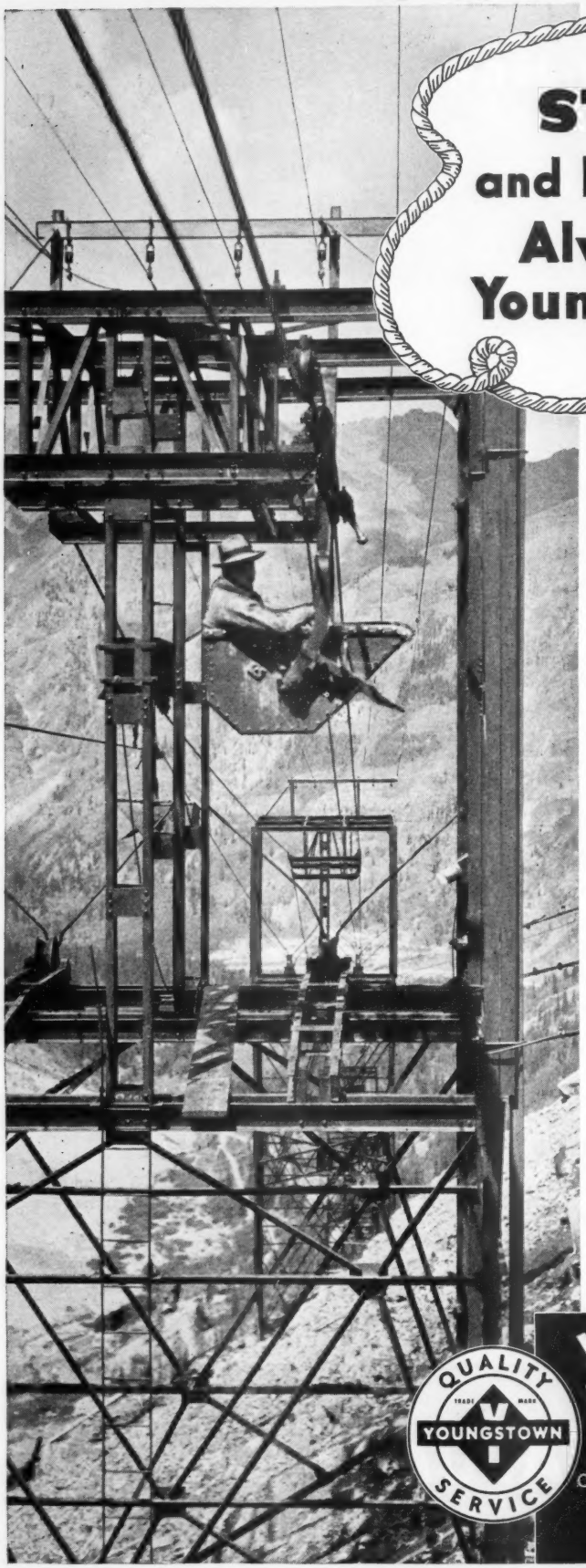
CORROSION RESISTANCE

. . . aluminum cannot rust or stain. Stands up in any weather.

MORE PEOPLE WANT MORE ALUMINUM FOR MORE USES THAN EVER

ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM



STRENGTH and FLEXIBILITY Always *"Firsts"* in Youngstown Rope Wire

On aerial tramways

AERIAL tramways span gorges, cross rivers, bridge roadless mountain slopes--to carry ores, precious minerals, waste rock, even men. Their construction and operation require thousands of miles of wire rope.

Usually located on difficult terrain, frequently in almost inaccessible spots, a tramway breakdown disrupts production, is costly to repair. That means the wire rope must be good. Strength and flexibility are "firsts," as are also toughness to resist abrasion and ability to resist corrosion.

These important qualities are imparted to wire rope by the wire from which the rope is woven. In Yolectro High Carbon Rope Wire, these qualities are built into the product--closely controlled and guarded at every step of manufacture, from the moment steel is poured from the open hearth clear through the final inspections.

Yolectro High Carbon Rope Wire, like all other Youngstown wire mill products, is of finest quality steel, refined, rolled and drawn to exacting specifications.

Photo—Courtesy Preformed Wire Rope Information Bureau.

QUALITY TRADE MARK YOUNGSTOWN SERVICE

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

GENERAL OFFICES - YOUNGSTOWN 1, OHIO

Export Offices - 500 Fifth Avenue, New York City

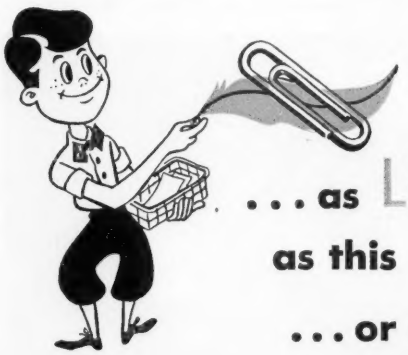
Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

Bars-Rods-Wire-Cold Drawn Carbon Steel Rounds-Electrolytic Tin Plate-Coke Tin Plate-Pipe and Tubular Products-Sheets - Plates - Conduit - Tie Plates and Spikes.

Whether you make products

. . . as SMALL as this . . . or as LARGE as this . . .



. . . as LIGHT as this

. . . or as HEAVY as this

we have the WIRE to fit your needs !

IF your wire application is an "everyday" one, the chances are that you can find the right wire for your needs among our more than 400 different types of manufacturers wire. However, if you need a special analysis, grade or shape, we can take care of you just as easily. You can count on our excellent production facilities . . . unexcelled research equipment . . . our 100 years of quality wire-making experience to draw wire that will meet your requirements exactly. American Wire will provide trouble-free production and help insure the satisfactory performance of your product.

Our engineers will gladly help you to determine which American Quality Wire is best suited to your needs.

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
COLUMBIA STEEL COMPANY
San Francisco
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York
UNITED STATES STEEL

If you make it of wire . . . make it of the best

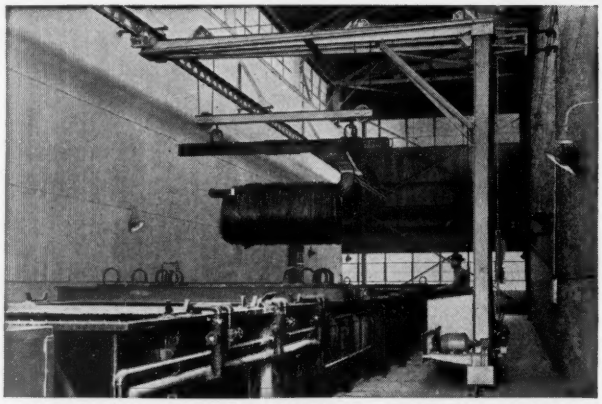
U·S·S AMERICAN

MANUFACTURERS WIRE

USS AMERICAN MANUFACTURERS WIRE UNITED STATES STEEL

MATERIALS HANDLING IN THE WIRE INDUSTRY

Many wire and wire products plants are enjoying the numerous advantages possible with Cleveland Tramrail. They are speeding production and lowering costs by using larger production units, eliminating rehandling and reducing machine "shut-down" time. They are using overhead space to save floor space. They are promoting safety. In many instances they are eliminating need of plant expansion by installing Cleveland Tramrail.

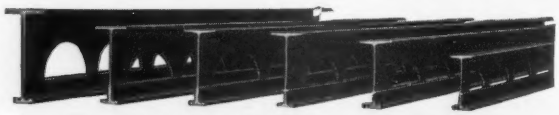


Cleveland Tramrail cleaning house gantry cranes boost production, cut costs sharply and greatly aid health and safety conditions.

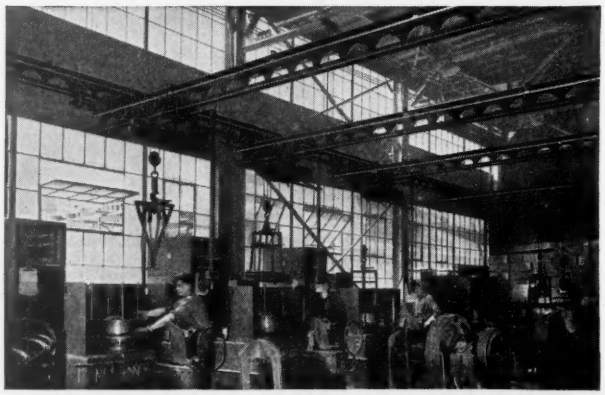
STANDARD ITEMS EASILY COMBINED TO HANDLE MATERIALS OF ANY KIND

Cleveland Tramrail raised-tread long-wear rail.

Cleveland Tramrail consists of standard items such as rail, switches, carriers, cranes, hoists, grabs, etc., which can be combined in a thousand-fold ways to serve nearly every materials handling requirement.

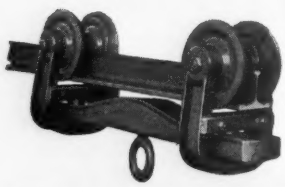


Cleveland Tramrail Archbeam in seven sizes for various loads and conditions.



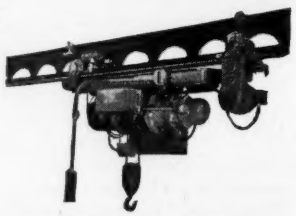
Providing each drawing block with an individual Cleveland Tramrail stripping crane speeds production and brings about sizable savings. Hernia injuries from heavy liftings are eliminated.

30,000 INSTALLATIONS



Hand propelled carrier built for long life and easy operation. Wheels have hardened tread and flange; bearings are double race type.

Backed by experience with 30,000 installations in industries of all types, Cleveland Tramrail representatives are in exceptionally good position to serve you. They will gladly advise, survey your plant, make layout or prepare quotation without obligation.



Motor-driven carrier with electric hoist. One of many types built by Cleveland Tramrail.

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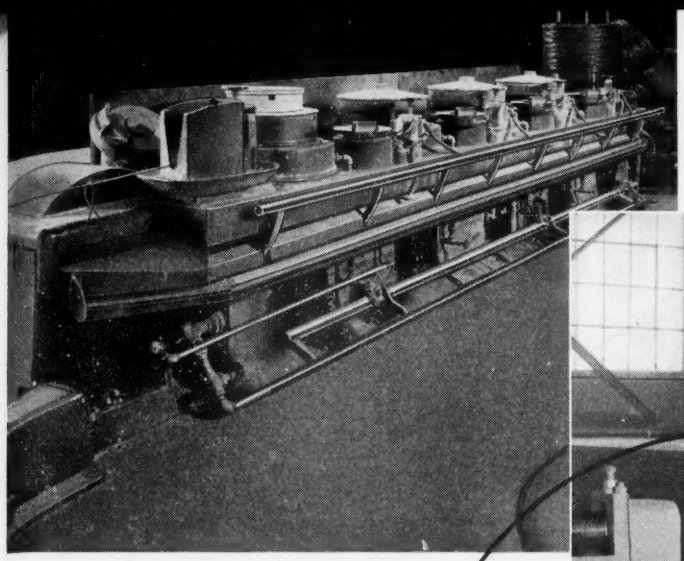
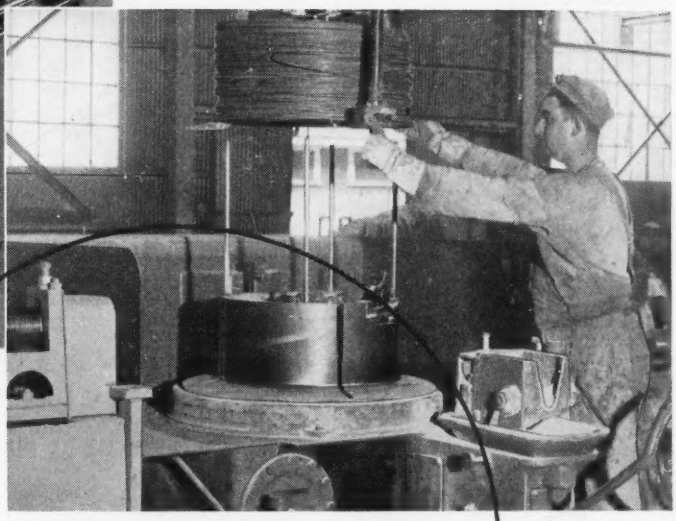
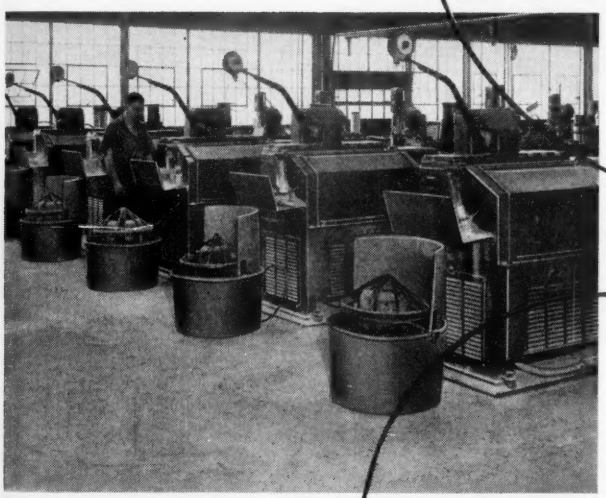
OVERHEAD MATERIALS HANDLING EQUIPMENT







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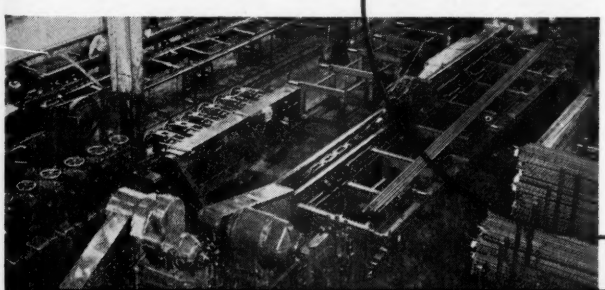

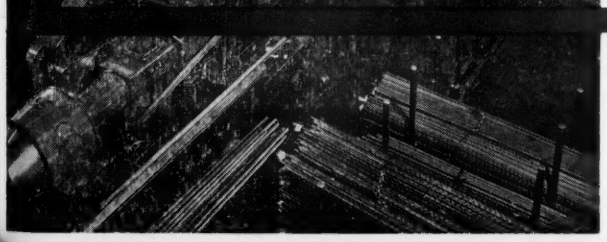

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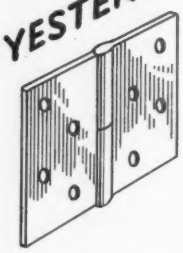

TODAY

WE HELP BUILD AUTOMOBILES

IN 1900—

the horseless carriage began to make its appearance on the streets of cities and towns throughout the United States.

The automobile, with its ignition and lighting systems, together with the use of wire for springs, piston rings, ground strap and other parts, created a demand for steel and copper wire, both bare and insulated, unheard of up to that time.

THE NEW ENGLAND BUTT COMPANY, always keeping abreast of the times, and always looking for new products to manufacture, immediately sensed that a new industry was being born.

"Butt" engineers have, through the years, developed a complete line of wire stranding, cabling and insulating machines, until today "Butt" machines have become the STANDARD in electric cable plants manufacturing all types of ignition and automotive wires and cables.

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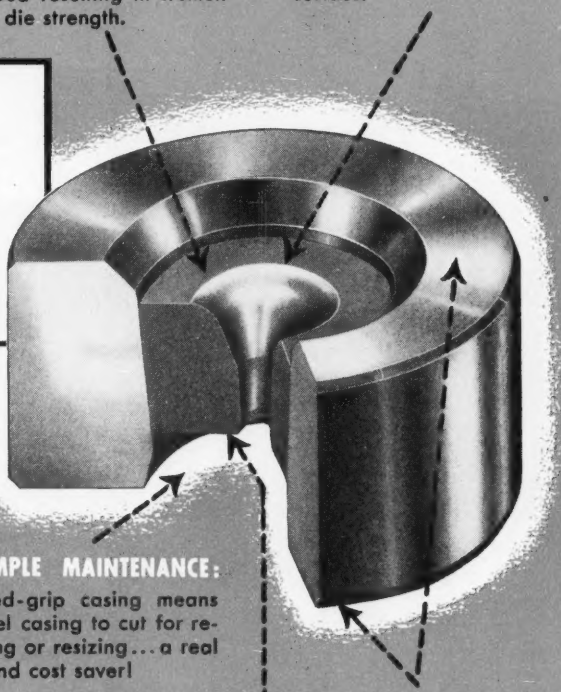

2. SIMPLE MAINTENANCE: Tapered-grip casing means no steel casing to cut for refinishing or resizing... a real time and cost saver!

5. FREE OF POROSITY: Another outstanding achievement is the V-R die quality control for the elimination of porosity in carbide. In addition, V-R Tantalum/Tungsten carbide die nibs take a higher finish than any other die material.

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For unsurpassed performance, V-R carbide dies for wire, tubing, bar and rod, cost less than any other die material!

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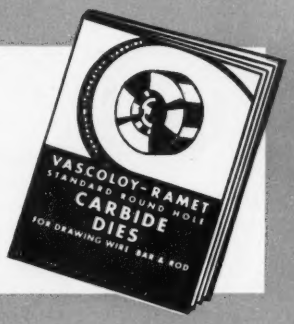

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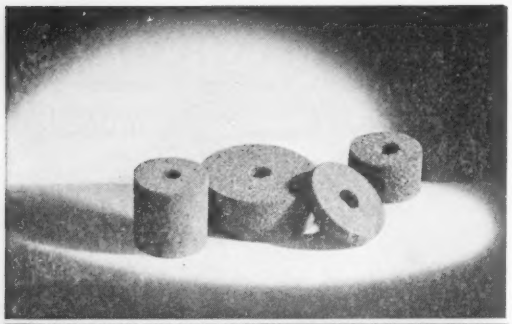

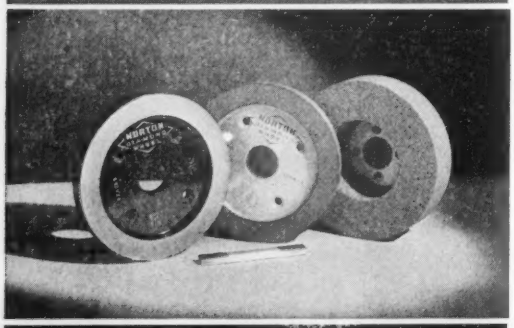

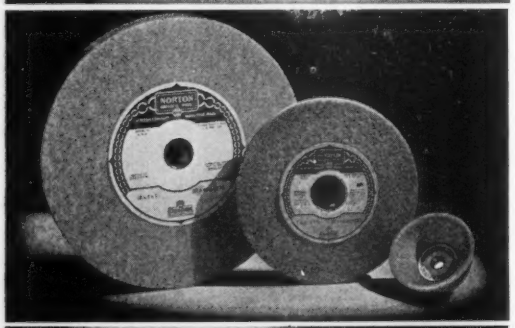

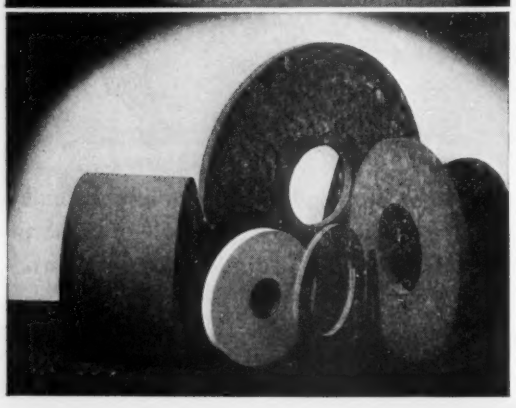

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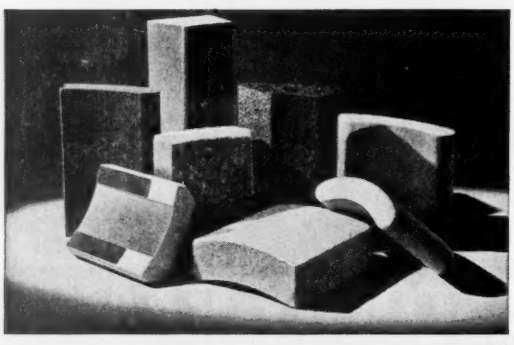

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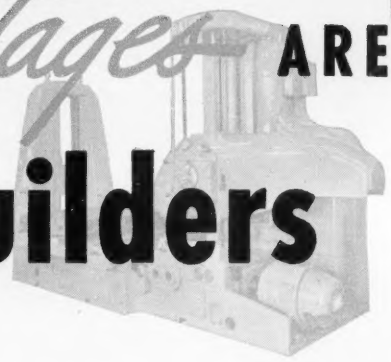

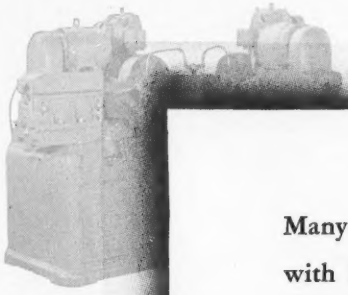

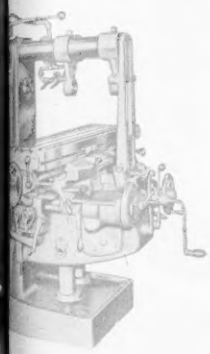

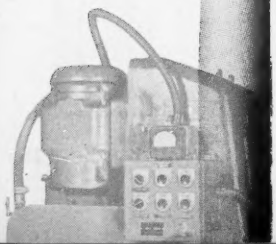

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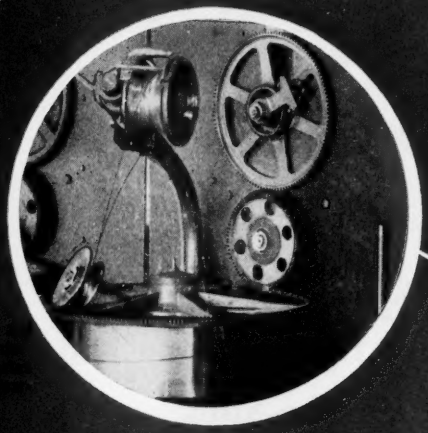
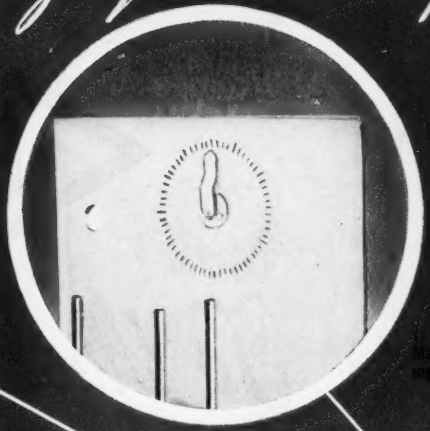
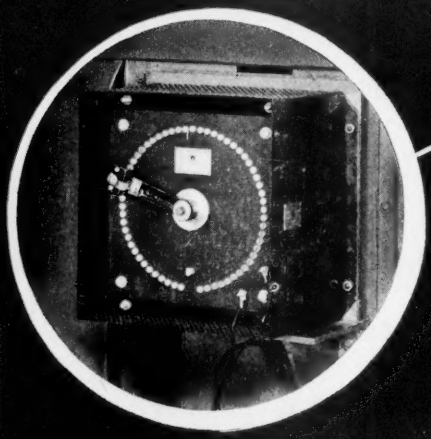
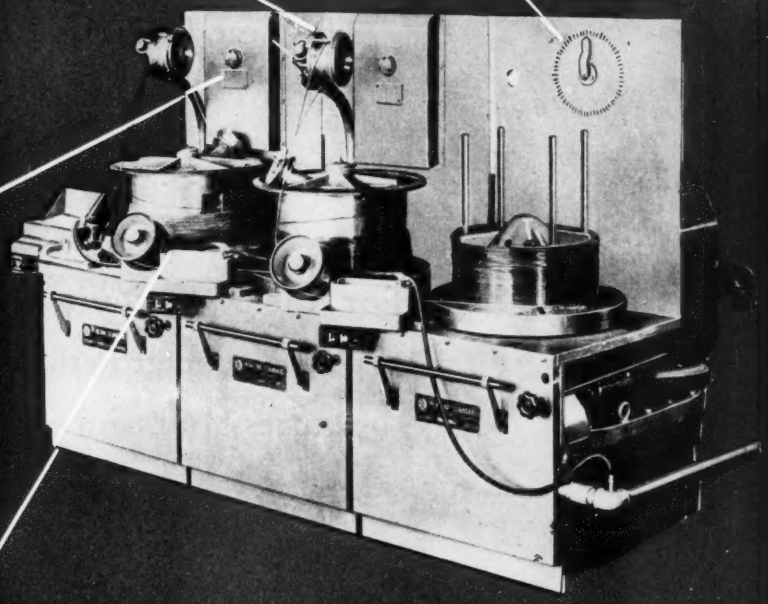
Auto-rheostatic synchronizing control system

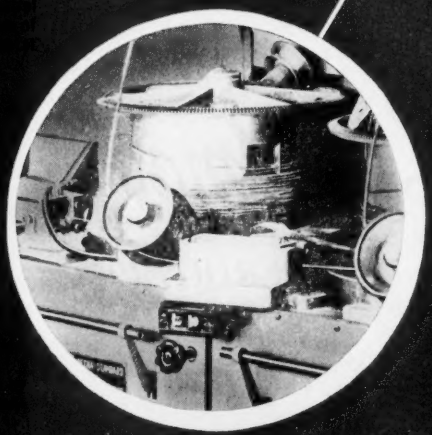




Manual dial and pointer for manual setting of wire drawing speed of finishing die.







Heart of the automatic operation of two or more Aetna Units in tandem, centers in the auto-rheostatic synchronizing control, which automatically synchronizes block speeds to compensate for the elongation of the wire through successive drawing dies.

It is easy to operate. Once threaded, the Units will run automatically and continuously as long as a continuous strand of rod or wire is being supplied.

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YOUNGSTOWN, OHIO

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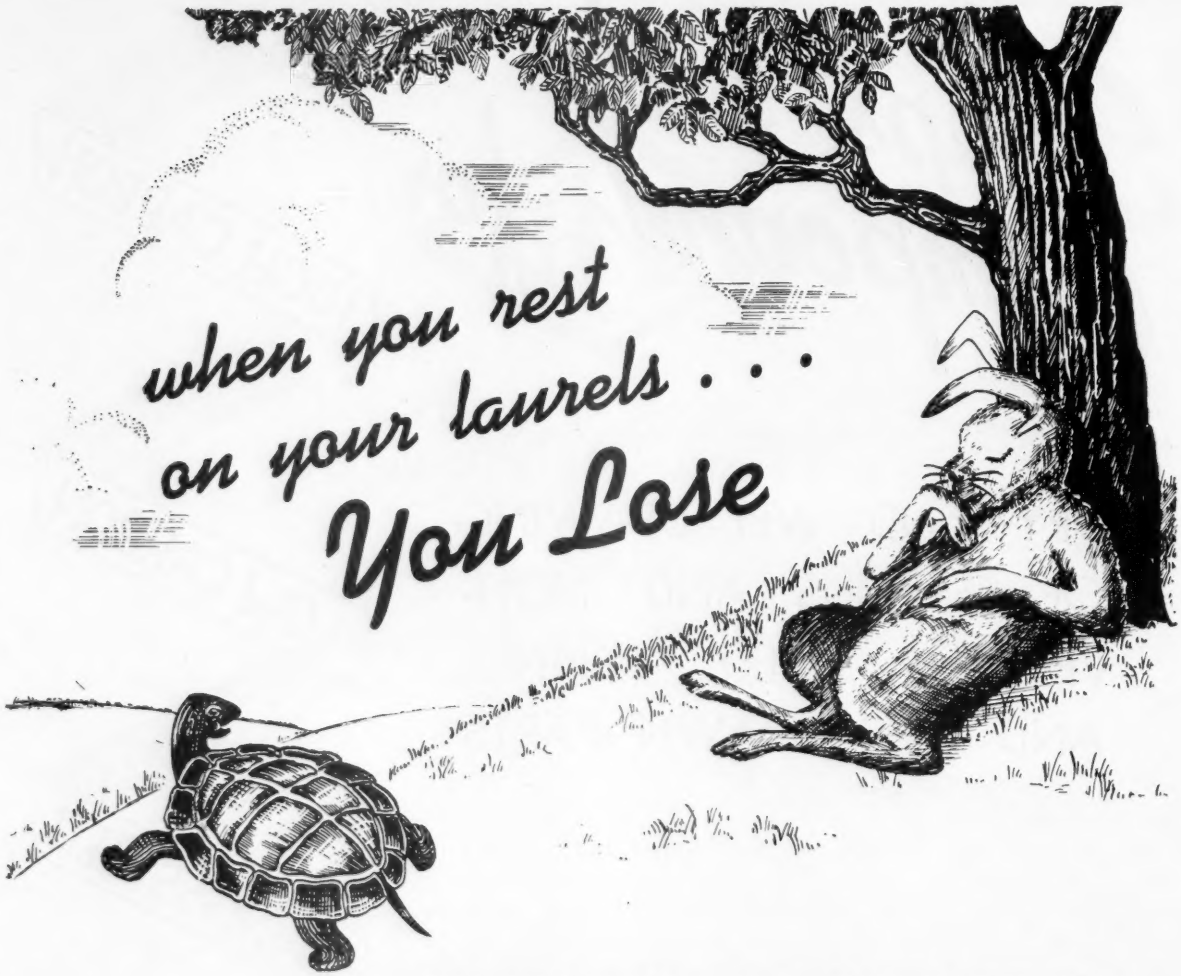

The story of the speed demon hare and the slow but steady tortoise illustrates, very clearly, the danger of resting on your laurels. The hare had speed to burn; he was good and he knew it. But while he took his "forty winks", look who won the race.

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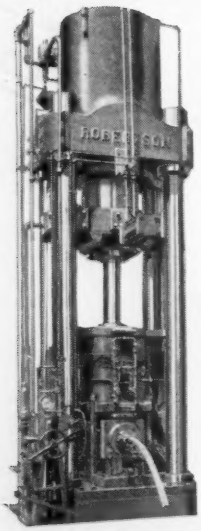
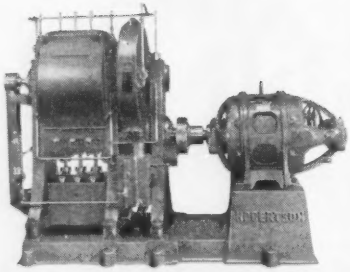


Cable Lead
Encasing Press



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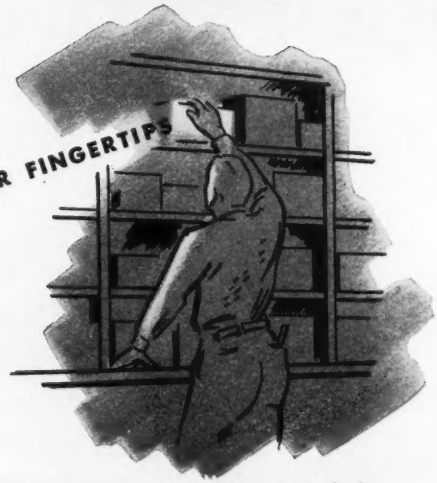

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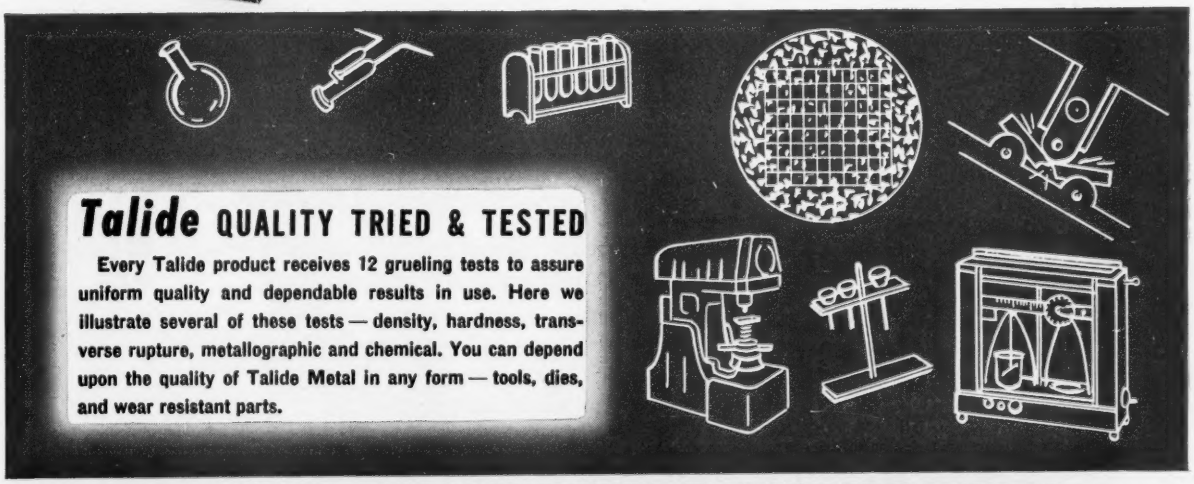

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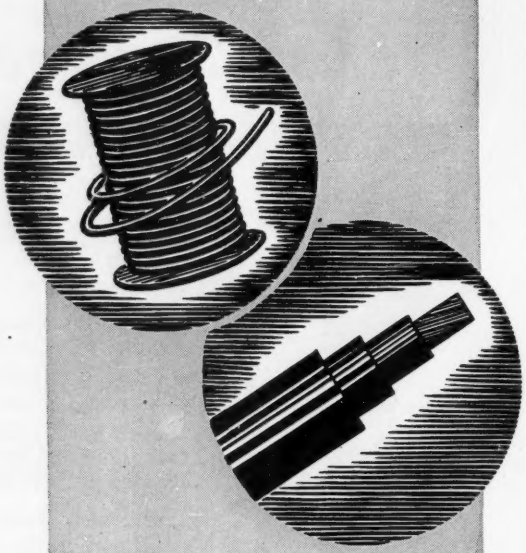

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Note the illustrations on this page. One tank is new; one is old. *But the tie-rods are the same.* Hauser-Stander took them from the old pine tank where they had seen seven years of continuous service, and used them to bind the new tank.

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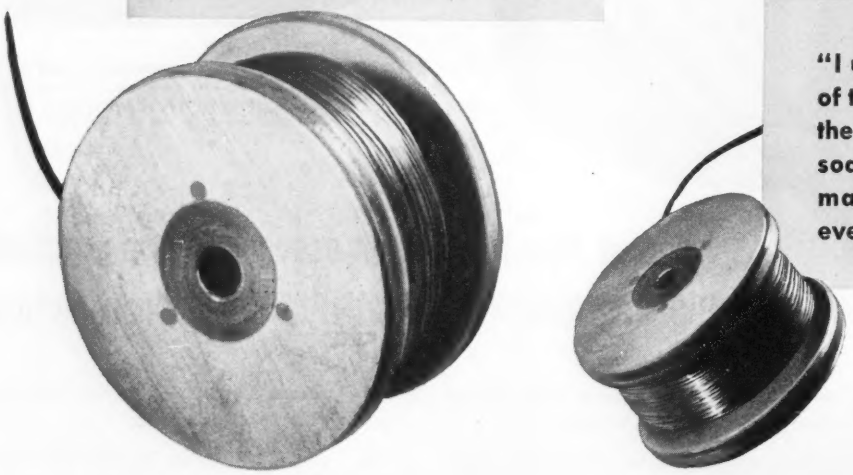

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The Wire Outlook

No one can foretell definitely the prospect of a better rod and wire supply next year until some semblance of specificness takes shape in the Marshall Plan. Already the Harriman committee has indicated that the beneficiaries of the Plan had overestimated their requirements by from five to ten billion dollars. It is to be hoped that Congress will cut these estimates further, for regardless of the "needs" of those countries to whom we contemplate lending a helping hand, every dollar we give away strains our war-weakened economy severely.

In the first year we would be expected to donate, as the Plan is now set up, some 3,481,000 tons of sheet, tin plate, finished steel, pig irons and scrap (nearly 1,400,000 tons of the last), and a total of 20,000,000 tons of steel and steel products in the whole four years. Included in the draft of the Plan are about half of our heavy tractor production and one-third of our freight car manufactures (100,000 cars). At current rates we are failing to meet our own rail needs and no end of domestic difficulties have already arisen due to lack of adequate distribution facilities.

Prices are 25% higher than they were a year ago, 100% higher than those of 1939 and 40% higher than in the "prosperity period" of the late 1920's. There is no prospect of either lower steel prices or of general commodity indices. Since the 20,000,000 tons of steel and steel products we propose to hand to sixteen participating nations is so sorely needed at home and the lack of it is more than likely to add to the problem of many of our manufacturers of just keeping going, where is the logic of the Marshall Plan?

To be sure, if food is necessary to keep people from dying by the thousands from starvation, by all means let us send it. One of our roving Senators, however, returned from Europe with the report that there was no evidence of starvation anywhere. When we give, we should do so on the basis of maintaining life and let the peoples of these countries work out their own problems. They'll be more virile and have greater self-respect in the end.

The stark fact is that our nation is not rich, has no surplus and cannot support the balance of the world single-handed. A nation whose national debt exceeds its wealth may have the outward aspect of affluence, but actually has a net worth of less than nothing.

A long step could be taken by the Government to put our economy on the road to soundness by reducing wartime taxes and paring government payrolls and outlays to a bare necessary minimum. Since a New Deal administration will never do this voluntarily, it is the job of Congress to lop off appropriations that maintain these excesses.

While the Marshall Plan is high-minded and generous, it must not be forgotten that the gravy train boys with things to sell are pushing to get their special interests aboard the train.

Steel is being produced at the record rate of 85,000,000 tons a year. Since this is not enough to meet domestic demands, Congress should move slowly in making our shortages more acute. Certain steels, like stainless, are in good supply, as are many alloys, both ferrous and non-ferrous, but these represent small fractions of the total tonnages.

Steel shortage is emphasized because it represents the most serious single bottleneck in our industrial economy.

Meanwhile, carbon steel rods and wire will be hard to get and the degree to which future shortages will continue, will depend to a large extent on how free-handed our solons decide to be with goods and materials that we do not have to spare. Also, the fact that those nations who hope for help padded their estimates so far beyond reasonable "needs" is something that merits serious consideration.

A sharp rise in building is predicted for 1948, which will call for much metal in many forms. Although 1947 fell short of earlier estimates, the pressure of demand for homes, places of business and plants cannot be denied. Let us give heed to the needs of our people!

—from the Editor's Desk

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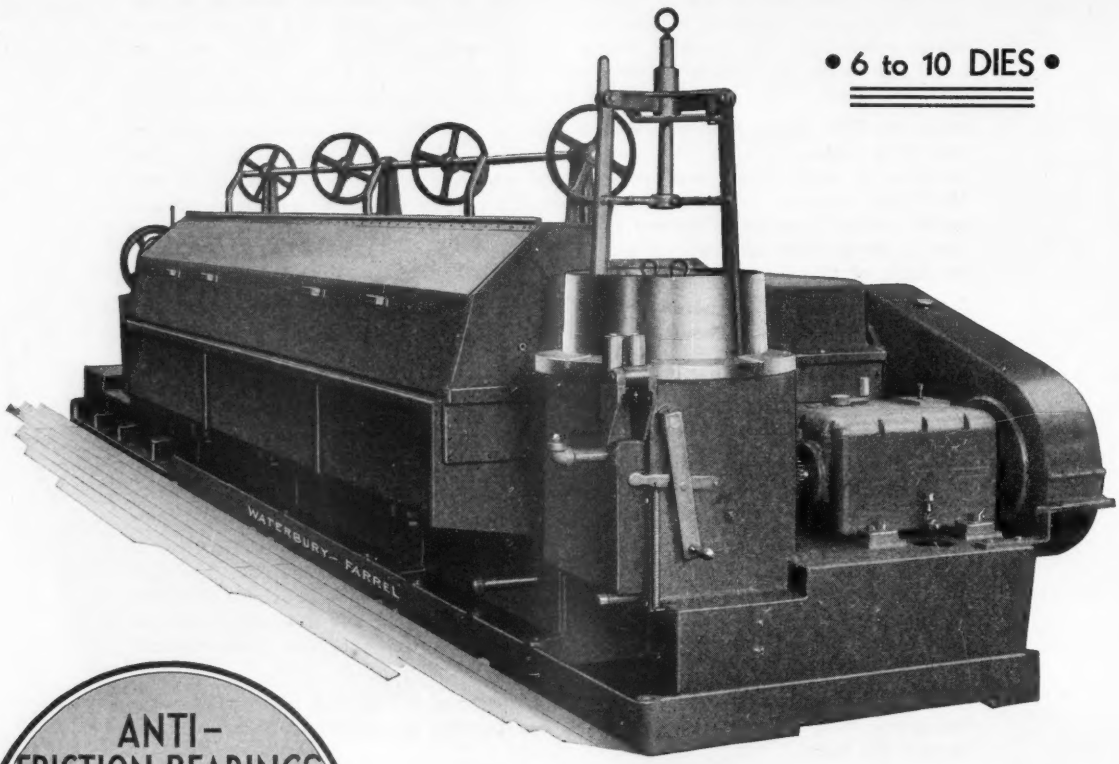

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A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
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Vol. 22 December, 1947 No. 12

Measuring Diameter of Fine Wire

by Robert W. Carson
Carson Micrometer Corporation
Little Falls, New Jersey.

Measurement of wire diameter to an accuracy of 1 per cent presents an increasingly difficult problem with finer sizes. Here is a discussion of the advantages and limitations of various types of diameter measuring instruments, with an analysis of the effect of anvil pressure on accuracy of measurement. A Paper prepared for the WIRE ASSOCIATION ANNUAL Meeting, October 22, 1947, Chicago, Illinois.

MEASUREMENT of wire diameter usually is no problem for wire sizes over .015 to .020 in. because the ordinary hand micrometer does a pretty good job. But as sizes go under .010 in. and particularly for softer wire, the problem becomes progressively more difficult — because of the inherent limitations of the hand micrometer.

* * *

THESE limitations are of two types, mechanical and physiological. As for the purely mechanical limitations, the principle one is inherent in the measuring method employed by the micrometer. In setting a micrometer, the screw forces the anvil against the wire until it builds up enough pressure on the micrometer threads to cause binding or friction that can be felt by the fingers. These forces are much greater than is ordinarily realized: even a light-fingered operator will produce a pound of pressure on the anvil and screw threads. The average man will run it up to two pounds, and three pounds or more is fairly common.

* * *

THIS force distributed over the limited area of thread engagement results in unit pressures in the range of 100 lb. per sq. in. on the threads and causes wear in the lead screw. Such forces over the concentrated areas of contact between the anvils and a round wire causes anvil wear, and on soft or fine wire may produce flattening of the wire.

* * *

THE physiological factors are common experience to any wire man. Sensitivity of touch varies greatly between individuals, varies even with the individual. And there is sometimes even a psychological factor present. No one here was ever guilty of it himself, but probably each one of you can recall at least one instance from your years of experience when you suspected some one of being either a little light or a little heavy in his touch if it made the reading come right.

* * *

BUT before we go any further, there is one point I want to make clear. This discussion is in no sense a criticism of the hand micrometer. As it is produced today it represents high order of precision obtainable at a very low price. As with any measuring instrument however, the hand micrometer has its limitations, and attempts to use it for work beyond its ability will only cause trouble.

* * *

RECOGNIZING the limitations of the hand micrometer, ASTM Standard D-374 was prepared 13 years ago, setting three tenths as the limit of accuracy with a ratchet stop, and five tenths without a ratchet. These values are for a 1-inch hand micrometer with: (a) vernier reading in tenths, (b) ratchet set for standard friction, (c) certain calibration requirements, and (d) under the following operating procedure:

1. **Measurement is started with reading 4 or 5 mils greater than the diameter to be measured.**
2. **Using ratchet, micrometer is brought down to work at a rate of about 2 mils per second.**
3. **Reading is taken after third click of the ratchet.**

BEFORE making the measurement the micrometer must be known to meet the following calibration

requirements according to this ASTM Standard:

1. **Anvils must be flat within half a tenth.**
2. **Anvils must be parallel to each other within one tenth.**
3. **Ten trials at zero must give ten good zero readings (defined as overlapping of 2/3 the width of the zero line and reference line when viewed with a low power magnifying glass.**

ACCURATE ratchet adjustment is important. As required by the ASTM Standard, ratchet friction must be adjusted to develop a unit pressure between anvil faces (at the third click) not less than 23 and not more than 27 pounds per square inch. In terms of pressure against the work, this is 28 to 32 ounces, or about 2 pounds pressure. And under a two-pound load on the frame, Federal Specification GGG-C-106, Par. E- li permits .0001 in. deflection.

* * *

GOING back to the opening statement in this paper, a hand micrometer does an acceptable job on wire sizes over .015 to .020 in. because the inherent errors of this instrument are small in comparison to allowable tolerances on wire diameters. But for smaller wire sizes other methods offer advantages.

* * *

BEFORE looking at other measuring methods, an acceptable level of measuring performance should be set up. CABRA tolerances on diameter are about 8 per cent of the diameter, and out-of-round is usually specified as not more than half the gage tolerance. Many customers want and sometimes order to closer tolerances. So our ideal measuring instrument should be accurate to 1 per cent of the diameter being measured.

* * *

AN ideal measuring instrument should be so constructed that its sensitivity is better than its repeatability, and its repeatability is better than its accuracy.

* * *

PERHAPS we had better define these terms. Sensitivity is a measure of the smallest change that an instrument can detect. We may not be able to measure the magnitude of this change but we should be able to find it. A hand micrometer can just detect a difference of the order of .0001 in., as for example, when slightly out-of-round wire is rotated between anvils set to maximum diameter.

* * *

REPEATABILITY is the amount by which repeated readings differ on the same work, assuming measuring conditions are held constant. The principle factor here is variations in sense of touch. Few operators can consistently hold to .0001 in. and blindfold tests show about twice as much.

* * *

ACCURACY is expressed as the maximum deviation from true linearity caused by errors in the screw and in lack of parallelism and flatness of anvils. The total of these errors according to the ASTM Specifications is .0002 in.

* * *

DIAMETER of scale, space between graduations and readability are also closely related to accuracy, repeatability and sensitivity. The smallest scale division that can be read with normal vision and lighting is about .020 in. For practical purposes, accuracy should be within one scale division and repeatability should be better than one division. For a feeling of confidence in the reading, sensitivity should be greater than the smallest observable reading. There is nothing gained in using a longer or larger scale if it only magnifies observable errors and deviations.

* * *

IF we accept that best performance as to accuracy and repeatability for a hand micrometer is .0002 in. it is obvious then that a vernier scales gives finer graduations than are justified.

* * *

FOR wire diameter readings to an accuracy of 1 per cent the smallest diameter for which a hand micrometer, Fig. 1, should be used is .020 in. This checks fairly well with experience, and indicates that some other method is needed for finer wire.

* * *

FOR more accuracy on fine wire the barrel micrometer, Fig. 2, is often used. Instead of .025 in. per revolution, it is made with a 50-pitch screw giving .020 in. per

Fig. 1. — Hand micrometer is usually satisfactory for diameters over .020 in. Variations in feel, and relatively heavy anvil pressure are serious limitations for measuring this .010 in. spring wire to an accuracy of one per cent. * * * * *

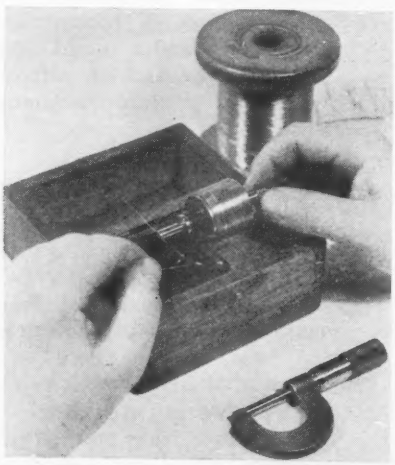


Fig. 2. — Barrel micrometer provides a little more readability on its larger drum and with care and skill can measure .010 in. spring wire with one per cent accuracy. For soft wire, however, anvil pressure is high enough to cause some deformation when using the ratchet stop. * * * *

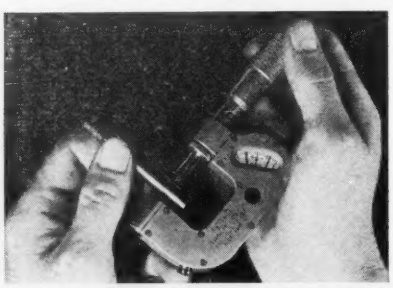


Fig. 3. — Anvil pressure is constant for this Federal Dial Micrometer thus overcoming one of the major limitations of ordinary micrometers. The dial micrometer will measure .005 in. spring wire with one per cent accuracy, but may deform soft wire of smaller diameter.

revolution. The barrel, about 1¼ in. diameter, has 200 divisions, or one for each tenth. Divisions are spaced approximately .016 in. apart with line and space each about .010 in. wide. These graduations are spaced about the same as 64ths on an inch scale, and represent the limit of readability for normal vision under good lighting.

* * *

AN operator with considerable skill and a light touch can repeat readings to .0001 in. on any one instrument. Because of light construction of the frame and finer pitch of the screw, however, ratchet settings tend to cause greater deflection, and "fly-wheel" effect of the larger and heavier barrel can result in more over-travel unless the barrel is moved slowly up to the reading.

* * *

ONE common source of error in using a barrel micrometer is in failing to use the same "feel" for setting zero as is used in taking a measurement. The tendency is to use the ratchet with its one to two pound anvil pressure to set zero, thus introducing some deflection in the frame, but to use only light touch on the barrel for setting against a fine wire. The normal result is to get a reading as much as a tenth under actual diameter.

* * *

BUT assuming that the barrel micrometer can be depended on to one tenth for accuracy, repeatability and sensitivity, a wire diameter of .010 in. then is the smallest size that can be measured with an accuracy of 1 per cent. This still leaves quite a wide range of fine wire sizes to be covered.

* * *

ANOTHER instrument coming into more general use is the dial micrometer, Fig. 3, a hand micrometer having a small dial gage built into its frame. This design has readability better than a barrel micrometer and one other important advantage. Its measuring pressure of 16 oz. is constant and not dependent on the operator's sense of touch. It also has the convenient feature of a retracting lower anvil for easy insertion of wire without changing barrel setting. By turning the wire between readings, out-of-round shows directly as differences on the dial.

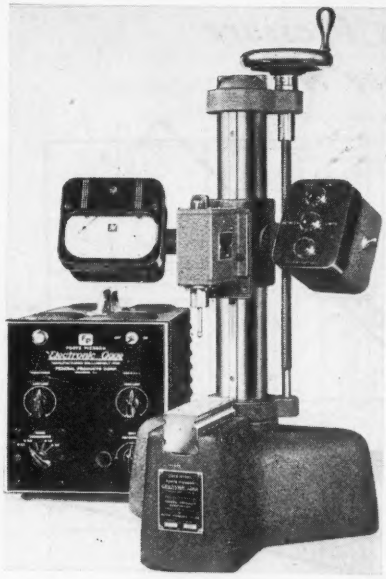


Fig. 4. — Comparators such as this Federal Foote Pierson Gage using electronic magnification have high sensitivity and are accurate enough for most uses if properly set to a calibrated standard. For soft wire flat anvils are necessary and anvil pressure must be kept low to avoid deformation. * * *

* * *

ACCURACY of screw thread is stated to be somewhat better than a hand micrometer. Repeatability is better also, partly due to constancy of measuring pressure which reduces variations in frame deflection and eliminates variations from sense of touch. Sensitivity is approximately half a division or .00005 in.

* * *

ASSUMING that the dial micrometer can be depended upon to half a dial graduation or .00005 in. the wire diameter for which this amount is 1 per cent is .005 in. For hard drawn bare wire, there is little possibility of permanent deformation of .005 in. wire under the 16 oz. anvil pressure of this instrument, but for soft or insulated wire, the observed reading may include some deformation for wire diameters under .010 in.

* * *

CERTAIN types of comparators have been used to some extent for fine wire diameters. By using optical, mechanical or electrical means these instruments can be designed for much higher magnifications than any of the other instruments described so far. One type using electronic magnification is shown in Fig. 4. But as comparators they all have one limitation that is sometimes overlooked. Their accuracy is not designed to be as great as their repeatability or sensitivity. These instruments are designed to indicate differences from a standard, and for such service

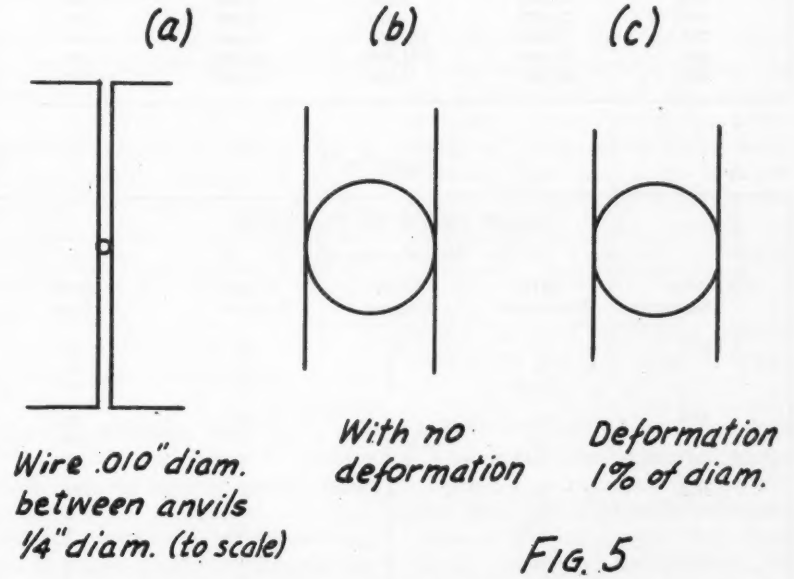


Fig. 5. — To help picture what happens to wire between micrometer anvils, (a) shows .010 wire drawn to scale with ¼ in. anvils. At (b) the same wire is enlarged ten times, and at (c) the diameter is decreased one per cent by anvil pressure. * * * * *

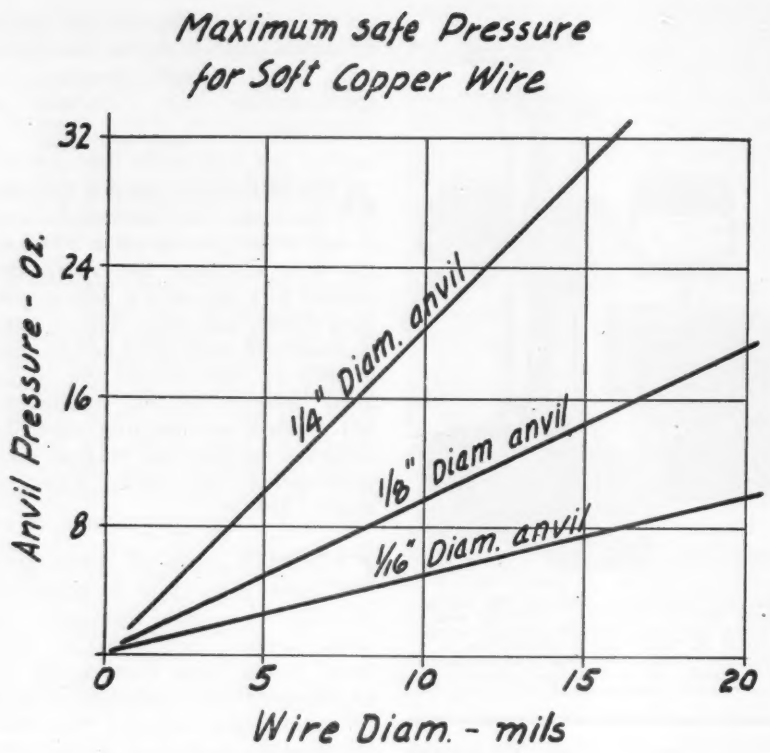


Fig. 6. — Based on stress calculations for soft copper wire, these curves show maximum safe anvil pressure for various sizes of wire with three different anvil diameters. * * * *

TABLE A

Wire Diameter	STRESSES FOR ANVIL PRESSURES OF			
	32 oz.	16 oz.	8 oz.	2 oz.
.020	14,000	9,000	6,000	2,200
.010	22,000	14,000	9,000	3,500
.005	35,000	22,000	14,000	5,500
.002	65,000	41,000	26,000	11,000
.001	102,000	65,000	41,000	16,000

TABLE B

ANVIL PRESSURE IN OUNCES				
		For a stress of:		
Wire Diameter	Anvil Diameter	15,000 Copper	25,000 Copper	50,000 Steel
0.10	¼	18	36	72
	⅛	9	18	36
	1/16	6	12	18
.005	¼	9	18	36
	⅛	5	9	18
	1/16	3	6	9
.002	¼	4	8	16
	⅛	2	4	8
	1/16	1	2	4
.001	¼	2	4	8
	⅛	1	2	4
	1/16	½	1	2

it is more important to magnify differences than it is to show the precise magnitude of differences. With higher magnifications, it is usually necessary to increase stylus pressure to obtain good repeatability and sensitivity. Frequent use of checking standards is usually recommended to hold the zero calibration.

* * *

SOME of these instruments require stylus pressures of 10 to 14 oz. which are high enough to cause deformation of soft wire of fine diameter. Stylus diameters are usually much less than ¼ in. and unit pressures against the work may be even higher than for ratchet settings on a hand micrometer.

* * *

IN all the measuring methods discussed so far, there is one other fundamental factor that is often overlooked: Elastic deformation of wire between the anvils must supply the energy required to operate the instrument. In Fig. 5(a) a wire .010 in. diameter is shown to scale between ¼ in. anvils. In a hand micrometer, elastic resistance offered by this wire must reach two or three pounds. Ordinarily, wire is considered as being rigid and unyielding, but this of course is not true.

* * *

AMOUNT of elastic deformation in a wire between anvils is a function of pressure and wire diameter, and can be expressed in terms of maximum stress set up in the wire. Any elastic deflection of the material is small enough that it can

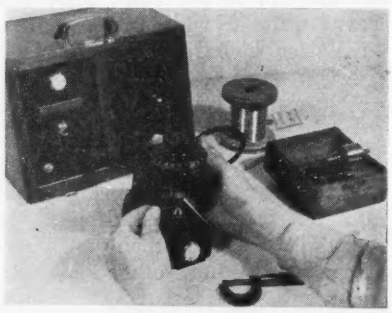


Fig. 7. — Model M Electronic Micrometer with ⅛ in. anvils and 2 oz. anvil pressure will measure wires down to .0025 in. with one per cent accuracy and with no danger of deforming the wire whether soft or hard. With ¼ oz. anvil pressure, .001 in. soft wire can be measured to an accuracy of 4 per cent without deformation. * * *

be neglected since it will be well under 1 per cent of the diameter. But if wire is permanently deformed under the anvil pressure as in Fig. 5(c), the error may be large enough to be an important factor. In fact, this is what fixes the maximum anvil pressure for measuring fine wire. Elastic stress set up in wire between anvils is given by the following formula:

$$S = \sqrt[3]{\frac{E}{2}\left(\frac{3W}{2\,l\,d}\right)^2}$$

where E = elastic modulus
W = anvil pressure in pounds
l = anvil diameter in inches
d = wire diameter in inches
For copper wire this relation becomes:

$$S = 2250\ (W/ld)^{2/3}$$

FOR annealed copper wire with a yield stress of about 15,000 lb. per sq. in., any stress higher than this will result in some permanent deformation. Stresses given by this formula for soft copper wire between ¼ in. anvils under various anvil pressures are shown in Table A.

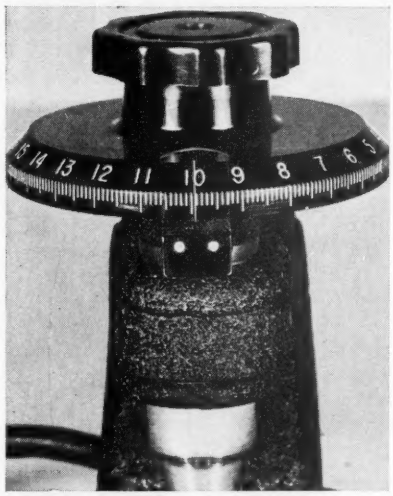


Fig. 9. — Large molded dial on the Electronic Micrometer is 3 in. in diameter, has 250 divisions, with one division for every .0001 in. Dial settings are easily read to ¼ division or 25 millionths. Instrument is set to zero by shifting index bracket. * *

THESE stresses are for anvils ¼ in diameter; for ⅛ in. diameter anvils stresses are about 50 per cent higher, and for 1/16 in. diameter about 75 per cent higher. When measuring steel wire (with an elastic modulus twice that of copper) stresses are 25 per cent higher than these values.

* * *

THE accompanying chart, Fig. 6, presents this relationship graphically for soft copper wire. For the diameter of the wire being measured and anvil diameter, the maximum safe anvil pressure can be read directly.

* * *

SAFE anvil pressures are higher of course for cold drawn copper wire. The following table gives calculated anvil pressure in ounces which will set up a stress of 25,000 lb. per sq. in. in hard drawn copper, and a stress of 50,000 lb. per sq. in. on steel wire. Pressures for 15,000 stress on soft copper are included for reference.

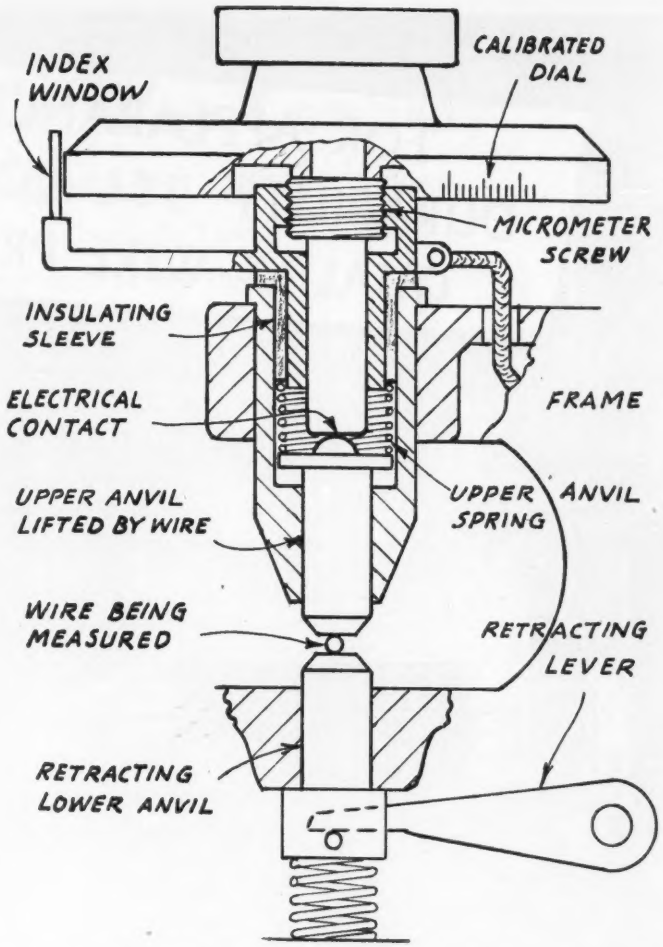


Fig. 8. — In the Electronic Micrometer the work holding function is entirely independent of the measuring operation, allowing selection of the one best combination of anvil diameter and pressure. Dial setting is indicated by contact between the micrometer spindle and the upper anvil which operates an electronic circuit with a sensitivity of 10 millionths of an inch. * * * * * *

ALTHOUGH this is a rather theoretical approach to the problem, it does check well with experience, and shows clearly the desirability of using much lower anvil pressure than has been common practice on fine wire. For material having higher yield strength or higher elastic modulus, pressures can be increased but the problem usually faced in a wire mill is to have a standard measuring method suitable for the full range of work.

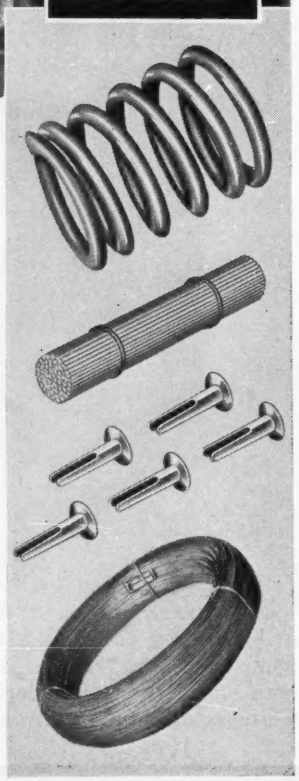
* * *

ADAPTABILITY to a complete range of wire diameter measurement, requires that the instrument should be adjustable to known values of work pressure, with consistent accuracy independent of work pressure. In the Electronic

(*Please turn to page* 995)

FOR APPEARANCE AND DURABILITY—J&L CONTROLLED QUALITY WIRE PRODUCTS

J&L STEEL



The fine appearance and durability of the multitude of items you make from galvanized wire depend upon the smooth, tight, and bright coating of the wire itself. At J&L, engineers, metallurgists, chemists and operating men have worked closely together for years to develop the best techniques and the finest materials to give your products the extra sales appeal they enjoy. This work continues at J&L in the galvanizing departments and in the laboratories—to bring you even better coated wire for even better wire products.

SPRING WIRE ARC WELDING WIRE FORMING WIRE LOCK WASHER WIRE
CHAIN WIRE TUBULAR AND BIFURCATED RIVET WIRE
WOOD SCREW AND MACHINE SCREW WIRE GALVANIZED WIRE

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

Johnson Steel & Wire Company
Worcester Wire Company
C. O. Johnson and Sons

by Kenneth B. Lewis

Consulting Wire Mill Engineer
Worcester, Mass.

An outline and history of the development of the Johnson Steel & Wire Company, Worcester Wire Company, C . O. Johnson & Sons at Worcester, Mass. The sixth of a series of articles on the history of American Wire Mills.

UNDER this triple title we have to consider the unique case of the **Johnson brothers, Charles David, Bernard,** and **George,** who founded and developed to success no fewer than three wire mills in Worcester.

* * *

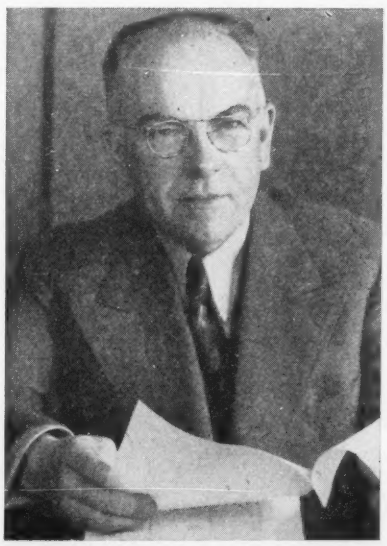
THE story may be said to have started in 1882, when **C. Oscar Johnson** arrived from Sweden. The **Washburn & Moen Mfg. Co.** was encouraging in every practical way the immigration of Swedes who either had had metallurgical experience or seemed to be temperamentally fitted to absorb it. In after years Johnson told of walking the ten miles to Wire Village, finding no vacancy, and walking back, finally finding a place with **Washburn & Moen.** In the next twenty years he rose to head the music wire department, and was destined for even better things when fate stepped in.

* * *

IN 1902, **George Thompson,** a bright young minor executive in the service of **Washburn & Moen,** stepped out, together with **J. D. Crosby** and a couple of others, and started a little wire mill in Charlton. This enterprise withered promptly, and is of no importance except as it influenced other events. It brought **George Thompson** in contact with **Harry Goddard,** head of **Spencer Wire Co.,** who had recently built his Worcester plant and had begun to realize that most of the profits in the wire business were in the high carbon end, of which he had no experience. **George Thompson** undertook to supply that experience, one way or another, and as a direct result he and **Mr. Goddard** began to haunt the Belmont Hill flat of **Oscar Johnson.** Their offers finally proved acceptable; **Mr. Johnson** moved over to Webster Square, whither he was soon followed, as a matter of course, by his son Dave, and, in 1907, by Ben, (Bernard). **Dave** and **Ben** appear on the pay-roll of 1911 as fine wire drawers.

* * *

HERE matters stood for about ten years, when **Dave Johnson** began to give serious thought to his future. If it seems a trifle odd for a young wiredrawer to do any serious thinking, and to give any thought to a future beyond next pay-day, bear in mind that the circumstances were unusual, as I shall explain in due course, and so was the young wiredrawer. Two courses commended themselves to Dave; one was to go back to his books, go through college and medical school, and establish himself in practice, the other was to start a wire mill. The odd thing is that he had the cash, honestly come by, and carefully stashed away in the bank, to give substance to these dreams.



Charles Johnson

* * *

RIGHT at this point this story must break with the Horatio Alger tradition. In his view there were two ways, and two only, in which a struggling young business man could get a start. He (1) saved it up, penny by penny, and kept it in his mattress, or, (2) he stopped a runaway horse, saved the life of a beautiful banker's daughter (they had beautiful bankers in those days) and the banker stepped up with a shot-gun, gave him the girl, and set him up in business. These didn't appeal to Dave; number one was too slow, and as for number two, horses were getting scarce, and he wanted to pick his own girl. Incidentally, he did a good job at that too. I may as well stop beating around the bush; Dave made the money in the stock market. Come to think it over, it's as good a way to start as you could name, provided you can make it work; no sensible man will deny that the courage, the patience, the cool judgment, the moderation, and the willingness to take a calculated risk, which bring success in Wall Street, are powerful factors in success in any field.

* * *

I will say, in explanation, that Dave was an errand boy at **Washburn & Moen** during the change-over to **American Steel & Wire Co.**

MOST of the officials of all grades, and many of the rank and file as well, had some of the new stock, by employee participation and otherwise, and one of Dave's extra-curricular chores was to cycle up to Kinsley & Adams at noon to look at the ticker and report back. The stock was feverish in those days; Dave saw it go up and down, got slightly dizzy, hopped on and off a few times on his own account; it's a familiar story though it very seldom has such a happy ending. Dave knew when to stop, and where to put the stuff, and when he paused some years later to map his life, he had the wherewithal to implement his decision.

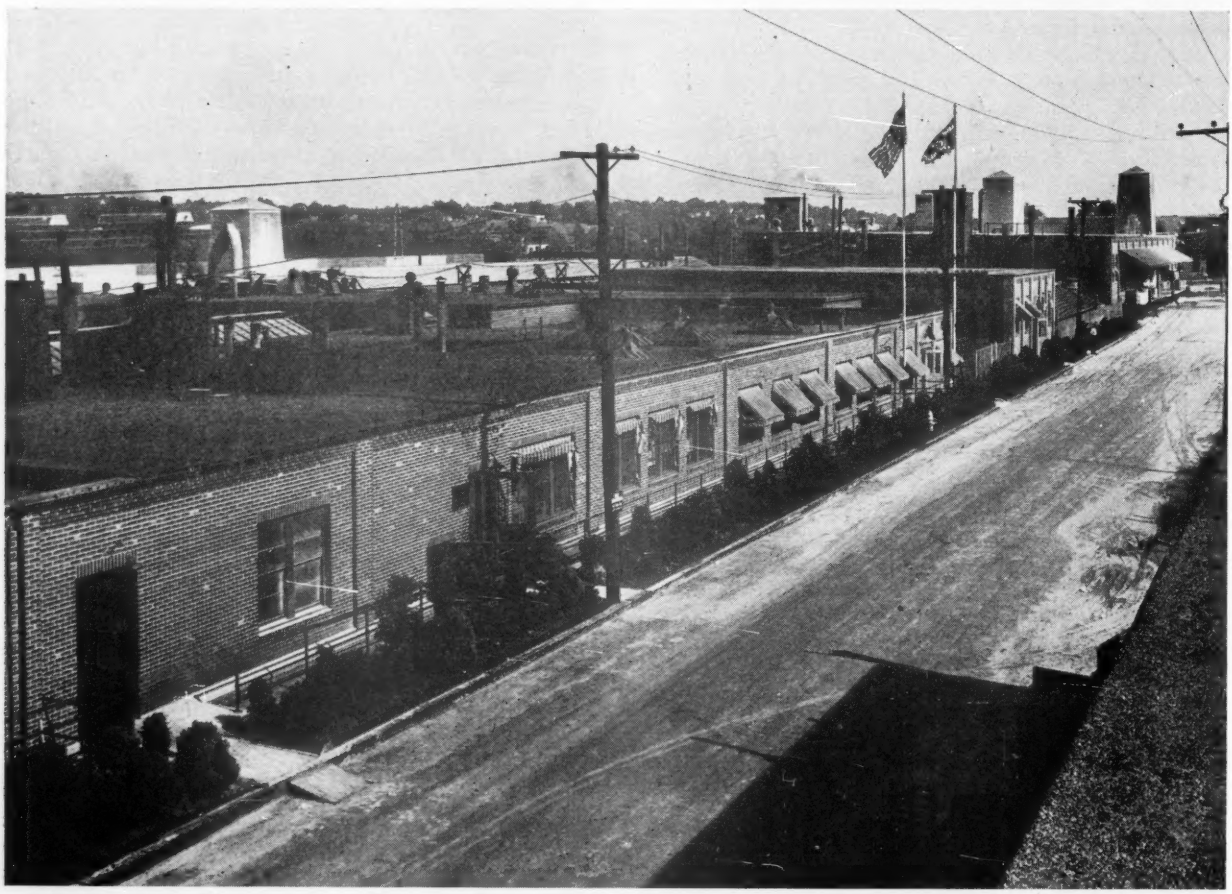
* * *

DAVE **Johnson** decided to build a wire mill. He disclosed his intention to his father, and got a very prompt and decided veto. A few words about **Oscar Johnson** are in order here. He held a responsible position at **Spencer Wire Co.**, as head of the music wire department, the core of the Spencer high carbon business, and was in no small measure responsible for the excellent position the company had built up in that rich market, and for the profits thereof. In those days metallurgy had scarcely begun to regularize mill practice and control quality. Certain individuals were known to have an instinct for quality in steel wire, which is simply another way of saying that their judgment and experience were highly developed. Their names were potent among the customers, and the name of **C. O. Johnson** carried a prestige that was almost a tangible asset. Mr. Johnson was a highly skilled, faithful, loyal, hard-working employee; in vision, initiative, and business sense, he was completely lacking. The boys must have inherited these qualities from their mother, who was of a family well known in military circles in Sweden.

WHEN **Oscar Johnson**, in language as emphatic as could be managed by a devout churchman, told his son that his insane project, if attempted, would ruin both himself and his father, and forbade him ever to mention it again, Dave shut up. The Johnson boys were well disciplined. But they were also stubborn. **Dave** said, "Dad, you want to keep hens; all right, I'll build you a hen-house." The contractor who looked over Dave's sketches, after cocking an eye at the foundations and framing, said "that's no hen-house, that's a machine shop." He was told to shut up and build it.

* * *

THE famly were living on Lakewood Street, near Webster Square, and the back yard ended in a steep bank that went down into a swampy area of no great value, which Dave had bought. Down there the hen-house arose. The hens spent happy days among



Johnson Steel & Wire Company, Worcester, Mass.

the grasshoppers and at eventide straggled back through the rear door of the house. Unseen from the road, a partition divided the building; the hens had the rear third; while in the front, behind white-washed windows and black-out curtains, Dave and Ben spent their nights and week-ends building a wire mill. They hung around pattern-makers till they learned the fundamentals of that trade, and whittled out their requirements, which they distributed to foundries in the surrounding towns. Machine work they could not accomplish with their simple tools was farmed out with great care. Not a whisper leaked out. Dave says he is sure his father smelt a rat, but he had his own code, and never even peeked through a crack in the partition.

* * *

IF I have given the impression that all the cash that went into the Johnson enterprise was coined from the blood and tears of widows and orphans through the abbatoirs of Wall Street, I now wish to correct the impression. A lot of it was coined out of the blood, sweat, and tears of **Charles David Johnson,** in circumstances now to be detailed.

* * *

AS soon as the hen-house project was well started Dave became aware that it was going to suck up money like a vacuum cleaner. How many of us have made that discovery! **Dave** did something practical about it. He started working double shift at the wire mill, a thing that was perfectly possible in those spacious days when a man was a man and an inspector was a louse. After a day's work on the Waterbury machines he would go home to a good hot supper, slip out to check up on the hens, and then back to the mill, where he would work till midnight or later. Then home to five or six hours rest, and up bright and early for a day's work again. Besides being a glutton for work, and a big producer under any circumstances, Dave was far from stupid, and found it possible to arrange cycles so that he could get a couple of hours or more entirely free in the middle of the evening, with all machines producing. Then out would come the International Correspondence text books and examination papers from the back of his locker, and he would spread out and go in for a little skull practice.

* * *

DURING this period he passed no less than six courses, including one in salesmanship to which I shall refer later. He also hung up a record for money earned. **Spencer-Wire** used to distribute a portion of the annual profits as a Christmas bonus, in which each man's portion was figured on the money he had pulled down during the year. On one of these Christmases the treasurer, when he handed **Dave** his check, remarked that it was the biggest check in the whole damned company, including the general officers.

* * *

DURING this period it is to be understood that **Ben** stood the night watches in the hen-house alone; **Dave** could put in only Saturday nights and Sundays, when the mill was closed. **Dave** will admit now that it was damned hard work. It was work in the best Horatio Alger tradition, money gained by honest toil, and hoarded up dollar by dollar. Sometimes in the late evening **Dave** would feel a little dragged down by the steady grind, and then he had a way of getting a lift. There was a locker inside his locker, and when I say locker I mean it was locked. In such an emergency as I have described, **Dave** would stick his head into the inner locker and take a short snort of something I hate to mention in this Family Journal. Horatio Alger, stop your ears; fathers, don't read this passage to your growing boys; it was rye.

* * *

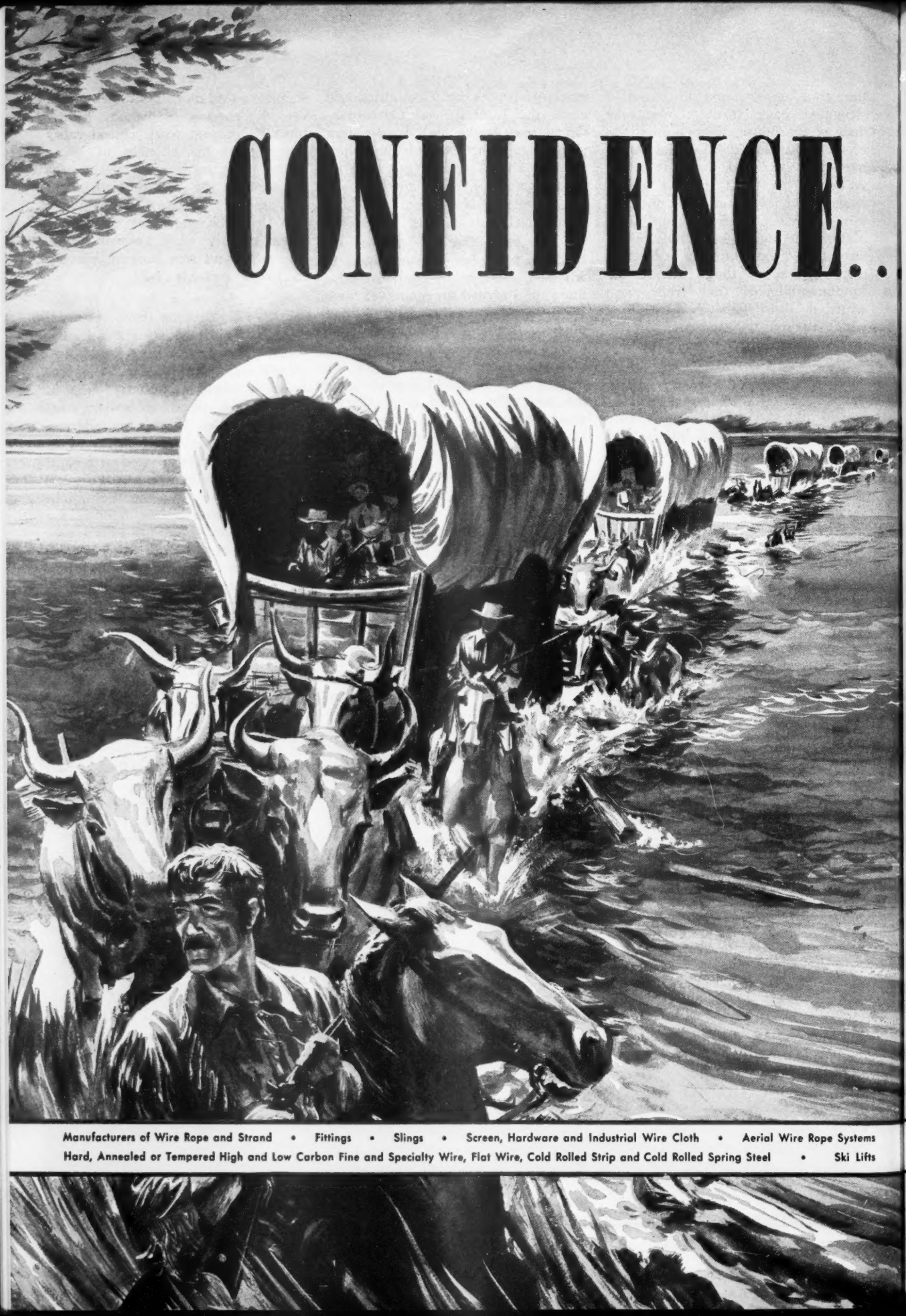
DAVE sometimes wondered if he was doing a sensible thing, burning the candle at both ends. Then he recalled the days of his flaming youth, and decided that drawing wire was a damned sight less laborious than dancing, and that the short snort at midnight was considerably less alcohol than was normally ingested by a young wiredrawer making the rounds of the hot spots. He had a shrewd suspicion that mortality tables would rate the chances of a man's killing himself by over-work considerably lower than his chances of being bitten by a rattlesnake while fishing through the ice. What sustained him more than any other factor was the knowledge that his mother knew exactly what he was doing, and why, and was backing him up in every possible way.

* * *

ABOUT this time there appeared in Worcester a fugitive figure, with whom the census takers never caught up, and who appears merely as a name on sundry bills of lading and purchase orders; his name, **Charles Davis,** his address, General Delivery, Worcester, Mass. Mr. Davis often appeared at freight depots at midnight, and in the small hours of the morning he might have been seen by the light of the waning moon, skidding heavy crates down the bank into the swamp. Apparently, however, he never was seen, and the hens never squawked. A little later, some of **Spencer-Wire** Company's customers were offered high carbon wires by this **Mr. Davis,** who showed an amazing familiarity with their requirements and whose prices were extremely attractive. These latter activities naturally came to the notice of executives in Webster Street. They called in **Oscar Johnson** and told him that a competitor was daring to lift his head right under their nose, a **Charles Davis,** and asked what he knew about it. The embarrassment of that painfully truthful and honorable gentleman can well be imagined; officially, he knew nothing, actually he saw it all. The best he could manage was a statement that he knew no **Charles Davis.**

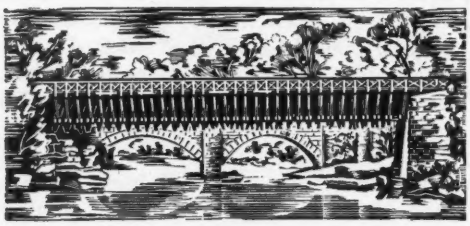
* * *

BY this time the boys were about ready to take off. They had a neat little double-lead patenting outfit, pickling and coating tanks, a couple of home-built 16″ bulls and some heavy 8″ blocks, and the sole purchased wiredrawing item, a small group of Waterbury fine wire continuous machines. There were also machines for polishing diamond dies, and the usual accessories of a card wire mill. Pro-



Manufacturers of Wire Rope and Strand • Fittings • Slings • Screen, Hardware and Industrial Wire Cloth • Aerial Wire Rope Systems
Hard, Annealed or Tempered High and Low Carbon Fine and Specialty Wire, Flat Wire, Cold Rolled Strip and Cold Rolled Spring Steel • Ski Lifts

.....how much is it worth?



IN 1844, three years before Alexander Graham Bell was born, and long before the first Prairie-Schooner crossed the Mississippi River, John August Roebling's confidence in the suspension principle of construction so impressed the engineers of the State of Pennsylvania, that they authorized him to build the world's first suspension aqueduct.

How much is his confidence worth to all the thousands of engineers who followed and to humanity in general that have benefited from his pioneering venture?

And how much is the confidence of the John A. Roebling's Sons Company in the future of American industry worth to you, that keeps Roebling development and Roebling products in the lead?

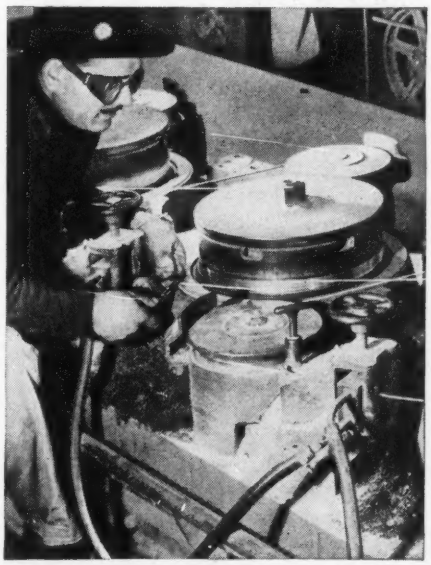
Roebling's greatest asset is your confidence in Roebling and its confidence in your future. That is why Roebling's every effort is dedicated to the preservation of this confidence—your's and Roebling's.

TO THE LAST THOUSANDTH OF AN INCH YOU'RE SURE WITH ROEBLING WIRE

CONFIDENCE is the chief reason why Roebling wire enjoys such wide acceptance throughout industry...helping to improve an almost endless variety of products. And this confidence is well founded.

Here at Roebling, you'll find the wire to meet your toughest demands... to the last thousandth of an inch, or lower if necessary. Your specifications will be met with the same degree of accuracy and consistency in steel analysis, physical properties, gauge, finish. Your savings will be reflected in reduced preparation time, smoother machine operation, fewer rejects.

At Roebling, we team up both product and service to your advantage. When you have a particular tough wire problem to solve, why not get the help of your Roebling Field Engineer? Call him at our nearest branch office.



JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

Electrical Wire and Cable • Suspension Bridges and Cables
Aircord, Aircord Terminals and Air Controls • Lawn Mowers

ROEBLING

A CENTURY OF CONFIDENCE

cess wire at sixteen gauge had been quietly secured from **Washburn Wire Co.** in New York, whose superintendent, **Julius Johnson,** was a friend of the family, and had come over from Sweden with **Oscar.** All this stuff had been smuggled into the hens' apartment with absolute secrecy; not a whisper had leaked out.

* * *

NOW came the most ticklish part of the whole enterprise. The name **C. O. Johnson** carried tremendous weight with the users of high carbon wire products; its prestige meant quite simply the difference between success and failure. Now came the supreme and final test of Dave's standing as a salesman; he had to sell this mill to his father.

* * *

WITH everything ready, and a nice little back-log of orders, one Friday afternoon the boys cleaned out their lockers and left **Spencer Wire Co.** for good. They worked straight through till Sunday night in the hen-house, by which time they had finished wire coming onto the blocks of the Waterbury machines. Then they called their father in. He looked over every item carefully, saying not a word. He felt of the wire on the finishing blocks, as the boys watched. Then **Dave** said "What do you say, Dad, **C. O. Johnson & Sons,** will you come in?" **Oscar** nodded, and said "All right." When he gave his notice at the mill Hell broke loose. **Dave** was interviewed by highly placed executives who warned him solemnly that his mad action would lead both him and the entire family into bankruptcy, that they would be ruined, and blacklisted, and humiliated, and so forth, and so forth. To all this **Dave** replied that he owned the mill free and clear, that he owed no man a cent, that he had plenty of working capital, and that if ever his operations seemed to threaten anyone's solvency he could simply lock the door and walk away and no man would be the loser but himself. To that there was no answer.

* * *

WITH the energy and industry of the boys, plus the prestige and know-how of the father, **Johnson & Sons** never faltered. They crowded out the hens, they operated beyond their capacity, and always they banked money. These were the days of 1917 and beyond, when there was business for all, and prices were highly satisfactory to the seller. **Dave** bought a piece of land on James Street for possible expansion, and to cover up his design planted it to potatoes. But eventually the thing had to be faced; they had to have a bigger mill. **Dave** was all for starting on the "hen-house" level, only somewhat bigger, that is, spending nothing but what they had in the bank. But his father had a friend, a fellow churchman, who was a financier, and who urged him to incorporate and start on a substantial scale and undertook to provide the funds. The ensuing councils and arguments went on for weeks, and **Dave** was finally talked down. The **Worcester Wire Works** was started on a really substantial scale.

* * *

THE new project was a success from the start. Tire bead wire was just coming into prominence and the **Johnsons** got into it early and deep. The competition was rocked back on its heels. They seemed always to be on the point of overtaking the **Johnsons,** but whenever they got there the **Johnsons** had moved on, and as a matter of fact that pretty well describes the situation today. Through the early nineteen twenties the **Worcester Wire Works** built itself up into a very strong position.

* * *

I want to digress here to speak of a wire man known and respected by a large circle of friends particularly here in the Worcester area. **Alfred Jacobson** served his apprenticeship in Sweden as a sheet-metal worker; I think few knew that, and I learned it only during the long talks we had while working together on the night shift. He was the most versatile mechanic I ever had the privilege of working with; he could make a piece of steel do anything but sing grand opera. See him doing a bit of blacksmithing and you would assume without a second thought that blacksmithing was his trade. He was an accomplished pipe-fitter, a pattern-maker, a carpenter, a machinist, a bricklayer, a rigger, well, to save time I will simply say that the only mechanical job I am sure he never tried was piloting a jet propelled plane. I can think of no job in a wire mill that I have not seen him handle, including polishing carbide dies.

* * *

JAKE came to this country and settled with **Washburn Wire Co.** in New York. Later he worked for the **Webb Brothers** in New Brunswick. During the building of **Worcester Wire Works** he presented himself to **Dave Johnson,** and **Dave,** after a check with **Washburn Wire,** took him on and found him an immense help in the multifarious and complex details of assembling and starting a mill. Later he went to Millbury and played a similar role in the starting of **Carl Lund's** plant, which is where I first met him. **Jake** had two sons growing up, and with their help he built and started the **Vanadium Wire Co.,** in Saundersville. This project ran head first into the market crash of 1929 and the ensuing depression, and never got onto its feet.

* * *

THE way I came to know and appreciate **Jake** is a story that has never been told and will never be told again. In 1932 I myself was concerned in a little crack-brained project which involved the building of a wire mill of microscopic proportions in a well hidden spot, and I engaged **Jake** to help me build it. This means that **Jake** built it while I handed him the tools and swept up the shavings. Later I ran the wire machines while **Jake** annealed, patented, pickled, coated, fixed dies, shipped, tested, and what have you. Between jobs he acted as consultant to another crack-brained project involving copper wire, conducted by another pair of desperados in the same hide-away. Well, the N.R.A. rolled over our little project and flattened it, and never felt the bump. Jake had a series of odd jobs and finally came back to **Johnson Steel & Wire Co.,** where

(*Please turn to page* 1008)

Highlights of the Wire Association Convention

Details of the Annual Wire Association Convention held at the La Salle Hotel, Chicago, Illinois, October 20-23 inclusive, 1947.

WITH a registered attendance of approximately 400, the 1947 Annual Convention of the Wire Association turned out to be the most interesting held so far. In general, the meetings were well attended, the papers were subject to considerable discussion, although because of the time limitations, some of the discussions had to be curtailed.

* * *

THE program as a whole was a little too much for a four-day session and for 1948 it is planned to have the convention extend over a five-day period in order that more and fuller discussions can be developed in the time available.

* * *

THE Convention was notable for the number of foreign members of the Wire Association who were in attendance. Representatives were present from Canada, England, India, China, Switzerland, Belgium and Sweden.

* * *

AT the Annual Directors Meeting held on Monday, the Secretary was instructed to select either Pittsburgh, Atlantic City or New York for the 1948 convention; selection depending upon the availability of hotels. The directors voted to extend the existing contract between **Richard E. Brown**, the **Quinn Brown Publishing Corp.**, and **The Wire Association** for a period of ten years from the expiration of the present contract, and instructed the officers to properly execute such new contract.

* * *

IN explanation to the newer members, the Wire Association designates **Wire & Wire Products** as its official publication and **Richard E. Brown** donates his services to the Wire Association for the sum of $1.00 per year. The agreement provides that in the event of the death or retirement of **Richard E. Brown**, the **Quinn Brown Publishing Corp.** will furnish the Wire Association the services of an executive secretary acceptable to the Board of Directors on the same terms and conditions.

* * *

THIS contract was entered into ten years ago as it was felt desirable to have a permanent business head for the activities of the Association, and has been renewed on the basis of the services rendered by the publication and the publisher having been satisfactory to the Association.

* * *

THE Board of Directors extended a vote of thanks to **Mrs. R. S. Spengel**, the assistant to the Executive Secretary, for her very fine work in handling the details at the convention, and also extended a vote of thanks to **Dr. F. R. Morral**, Chairman of the Program Committee for his able preparation of the technical program.

* * *

THE appointment was announced of **Mr. L. C. Crewe**, President, Maryland Fine and Specialty Wire Company, Inc., Cockeysville, Md., as **Chairman of the Program Committee for the 1948 Convention.** Members who have under consideration submitting papers for 1948 may obtain full information by writing to Mr. Crewe.

* * *

THE nominating Committee for Directors for 1948 submit the following names for election as directors: **John A. Moritz**, Supt., Wire Mills, Keystone Steel & Wire Company, Peoria, Illinois; **Sidney Rolle, Asst. Mgr.**, Scomet Engineering Company, New York, N. Y.; **L. D. Seymour**, Mfg. Mgr., Rope & Wire Fabrics Division, John A. Roebling's Sons Company, Roebling, N. J.; **Curtis Voigtlander**, Supt., Wire Mills, Union Wire Rope Company, Kansas City, Missouri; **C. L. McGowan**, Supt. Rod & Wire Mill, Atlantic Steel Company, Atlanta, Georgia. Ballots to members will be in the mail by November 10th.

* * *

DURING the week the Annual Wire Association Luncheon was held on Wednesday and the **Mordica Memorial Lecture** was delivered by **F. Titus Updike**, Chief Engineer, Products Engineering Dept., Round Wire & Cold Rolled Products Div., John A. Roebling's Sons Co., Trenton, N. J., on the subject of **"Wire In Automobiles"**. Following Mr. Updike's lecture, there was a demonstration of the Wire Recorder which proved to be most interesting.

* * *

AT the Annual Smoker-Dinner there was a record attendance and a good Show. However, the general opinion was that the Show was too long with too much of the sameness in the type of acts presented, and for 1948 arrangements are being made to correct this.

* * *

THE plant inspection trips were very well attended; 187 went to the Republic Steel mill, and 90 to the Western Electric mill. In both plants, guides were provided and full explanations given on all processes followed and equipment used.

* * *

FOLLOWING the Directors Meeting on Monday, at the opening of the technical sessions the president of the Association, **Roland M. Hussey**, Superintendent, Wire Dept., Jones and Laughlin Steel Corp., Aliquippa, Penna., stated .....

* * *

"Gentlemen, it is again my privilege and pleasure to welcome men of the Wire Industry and its good friends in the allied field of equipment and supply to this, the 18th Annual Convention of the Wire Association.

* * *

On behalf of the Directors of the Association, I extend greetings.

* * *

This opening feature of our program is termed an address by the President. Gentlemen, you don't want any address by the President, you want the program started.

* * *

You want technical presentations and papers full of information about the wire and allied industries. You will get those papers, in big game calibre and good quantity. Our program is replete with interesting subjects and there is every reason to believe they will be presented to you in an able manner by the respective authors. There are two (2) inspection trips on the convention calendar and they will afford much of interest to all of us.

* * *

We have Dr. Morrall, Metallurgist of American Cyanamid Corporation, and Richard E. Brown, our Executive Secretary and the Program Committee to thank for the full and splendid program in prospect for this convention. We also are greatly indebted to Republic Steel Corporation, and Western Electric Company for the privilege afforded us, for two inspection trips, in prospect for Tuesday and Thursday respectively.

* * *

Reservations already made, indicate an attendance equal to other convention times and that we are still sound in our judgement that men of the Wire Industry and their friends can make a convention successful without dominating affiliations.

* * *

I believe I can leave one serious thought with you. Prices generally are on the upgrade and seem to be making the grade. Costs of production make for higher prices and wages paid production workers are a big factor in production costs.

* * *

In basic steel industry, there have been four (4) across-the-board, hourly wage increases since April 1, 1941. These four (4) across-the-board increases amount to 46½ cents per hour; an increase of nearly 75% for common labor over the labor rate of March 1941. Shift differentials and inequity adjustments in many instances, further increase money per hour paid to the wage earner today.

* * *

Production in large volume per man hour is always the mainstay of production costs which in turn dictate sales price necessarily charged for the commodity. To effect the production of various commodities in large volume per man hour, incentive rates have been used to induce a man to earn more through greater effort.

* * *

As across-the-board increases were given to the wage earners, there developed the thought that such increases would, if repeated periodically, tend to destroy incentive rates."

* * *

In the plants of basic steel industry job class evaluation work has been or is being done, and now we have or soon will have a job class rate for each occupation. The job class rates now in effect serve also as the guaranteed rates per hour for every hour men work at their respective occupations; a wage earner realizes a fixed sum of money whether he produces much or little.

* * *

The job class rates, now in effect in many plants together with the four (4) across-the-board, hourly increases made in the past six (6) years, have created a condition, earnings wise, where many men may care less about putting forth the extra effort for additional earnings through incentive rates. Rates as now adjusted, are intended to give the wage earner a fair day's pay for a fair day's work. If then we agree to a fair day's work for a fair day's pay, how can we expect the worker to maintain a level of production to which he was accustomed six (6) years ago when part of his earnings accrued through incentive rates?

* * *

Herein may lie a tangible item among the causes for higher costs which in turn dictate higher prices.

* * *

I know you want to listen to men who will present the papers. In those instances where discussion is indicated, I hope you will feel free to participate; making your comments brief, to the point and in a manner audible to all. With many thanks to those who prepared papers and with respectful appreciation of their efforts to make the program a most interesting one I will ask Chairman, Dr. Morrall, to take over.

* * *

The Technical Sessions

IN the analysis of the technical sessions following, the discussions referred to will be published in full in the January 1948 issue of **Wire & Wire Products** together with the Mordica Memorial Lecture.

* * *

IN opening the technical sessions, Mr. Hussey, president of the Association, pointed out the various activities offered in this year's meeting and the chairman of the program committee called attention to the fact that specialists must not be allowed to become inarticulate but should be called upon to participate in discussions. Dr. Morral stated "those who tell do not know and those who know don't tell" and invited "those who know-to tell".

* * *

Monday, October 20, 1947

MR. Ralph Roth, who had prepared a symposium on **"The Improvements in the Wire Industry in the Last 10 Years"**, (Page 802 of the October issue of WIRE & WIRE PRODUCTS) abstracted a paper on brass, copper and bronze wire, prepared by **Mr. Wilcox**, of General Cable Company. Messrs. Gunstrom, Edinga, Rolle, Harmon and Wilcox entered into a discussion on the use of OFHC and its advantages over regular copper wire for enamel coated wire.

* * *

NEXT, a summary was presented on the improvements in the last ten years on **"Low and High Carbon Steel Wire"**, (Page 808 of the October issue of WIRE AND WIRE PRODUCTS). The original paper was prepared by **Mr. J. R. Thompson** of the American Steel and Wire Company. Mr. Voigtlander took exception to the statement that advances had been made in the fabrication of rods. Mr. Smith pointed out that the quality of the rods depended on steel practice, structure and other factors.

* * *

THE report on **"Stainless Steel Wire"**, prepared by **Mr. J. K. Findley** (Page 804) was reviewed by Mr. Roth, and the discussion pointed out that in Canada more than one draw was used, while in the United States only one was used. Lubricants were also mentioned, and they are considered good, although difficult to remove. Briefly, the improvements in the Alloy and Heat resisting wire field were presented by Mr. Roth.

* * *

MR. **K. B. Lewis** had prepared a paper on the **"State of the Industry in the Eastern Mills"** for the Symposium on the "Outlook and Present Trend of the Wire Industry". Mr. Rolle substituted for Mr. Lewis, who had been released from the hospital just a few days before the Convention. This report covered the poll made of some 20 mills. The problem facing all industry, as put by one operator, is to get back a nickel's worth of effort from the employee for each dollar's worth of wages paid. The operators seemed to be more alive to the basic realities of the situation than higher placed management, which appears to take an appeasement attitude. Recent im-

provements and some past ones receiving mention were carbide dies, lime substitutes, the bell type annealer and controlled atmospheres for fine wire; also centerless grinding of wire rods in the bundle.

* * *

PROBLEMS facing the industry, in addition to the cry during the last years for rods and labor, were the securing of heavier rod bundles, and possibilities of spooling off the finishing blocks. The capacity of production of non-integrated mills was estimated at between 30 to 60%, while 85 to 95% for the integrated mill; some of the former fearing they might be forced to sell out to larger competitors.

* * *

THE question was raised as to what the rod speed was on the centerless grinder under development. Your correspondent was informed by the manufacturer that they had started at 75 ft. per second.

* * *

MR. **Julian Schueler** presented his report on **"The Steel Industry in the Middle Eastern United States"**. Briefly, he related about drawing, dies, pickling, baking, rod and wire coatings, annealing, heat treating, and products. He did not expect much change in the tonnage output of wire and its products, or radical changes in manufacturing processes in the near future.

* * *

THE data on the wire and wire using industries of the **Western** states, abstrated from a California report was presented by Dr. Morral.

* * *

MR. **R. S. Brown**, Chief Metallurgist of Rylands Brothers, Warrington, England, a visiting member of the Wire Association, was asked to speak about the improvements of the Wire industry in his country. This he proceeded to do by showing a series of slides. Some of these may be seen in an article in the September 1947 issue of WIRE AND WIRE PRODUCTS, (Page 658-664). He pointed out that in his country the wire mills make mostly their own machinery. Their labor had been reduced somewhat by improvements; some of which related to processing. The trend is from small coils to large coils. Stripping is done in 1100# coils for the small sizes (⅜ in.) and up to one ton for the larger sizes. The above size is drawn at some 1200 ft. per min. It is handled in such large coils for further fabrication within the plant, but it is cut to smaller bundles when it goes out to other mills. Mr. Brown gave some interesting data on the **British Iron and Steel Research Association**, which has been organized within the last two years. It is financed by industry, and has the cooperation of mill men, reputed technicians and scientists. Within this organization there is a **WIRE** panel. Fundamental research should be of interest to the entire industry.

* * *

MR. **F. P. Spruance** called attention to a new product which may be used to rust proof galvanized iron, and he wondered if there was a need for it. It would take a 10-second immersion and costs about 6 to 8c per 100 sq. ft. on sheet. A member wondered if colored coatings were possible on zinc. Mr. Hussey indicated that there was a need for a material to protect zinc coated material—particularly when it is being sent out to the trade and it is held in storage.

* * *

SEVERAL other reviews were mentioned by name; Mr. Glenn's (Page 812), and Mr. See's, on submerged combustion in pickling. Dr. Morral called attention briefly to a salt bath process to melt aluminum, and demonstrations made on coating sheet and wire in this molten metal. The apparent extensive use made of phosphate coatings; a butt welding machine for fine wire; recovery of iron sulfate from pickle liquor and its uses, pickle liquor disposal and a recent new method using alcohol developed in Germany, the use of fine steel wires for tires, and fluorescence analysis for quick quantitative analysis of metals.

* * *

MR. Miller, of Montreal, asked if the United States' mills were as cramped for space as theirs were. Another problem of small mills is that of heat waste, and having a hot mill in summer and a cold mill in winter, cooling water being expensive. Work is being done to combine the two problems, which may result in an economical solution.

* * *

DR. Morral summarized the first session, indicating that the past had seen improvements in quality of the final product, improvement in processing and relative lower costs. The problem of labor is with us and will continue to be. The Outlook is that further improvements will be forthcoming in all four by closer control and research.

* * *

Tuesday, October 21, 1947

ON Tuesday morning the session started under the chairmanship of **Mr. Smith**, of American Steel and Wire. **Mr. H. J. Babcock** presented his paper on **"Electric Salt Baths for Wire Processing"**, which was illustrated with slides. He called attention to the fact that he was optimistic that the audience had read his paper (Page 751). The advantages of salt bath were mentioned; elimination of atmosphere, uniform heating and rapid heating-up time, ease of temperature control, lower capital investment, and many uses for metallurgical heat treatments, annealing, cyclic annealing, spheroidizing, patenting, etc. Descaling by two salt bath methods, the reducing type and the oxidizing type were mentioned, although one of these methods was to be presented in greater detail at another meeting. He advocated standardization of salt mixtures instead of building furnaces for a particular salt. In the discussion Mr. Gore pointed out that they obtained graphite on tools, and he wondered how often the pot should be removed to remove sludge. It was pointed out that an oxidizing type of descaling bath would be suitable. The Sikh visitor, Mr. Gill, disagreed on the use the author made of the term sorbite, and defined it as the transformation product from austenite.

* * *

A question was raised on cyclic annealing and whether one or two baths were required. "This is a matter of economics", said Mr.

Babcock. Salt baths further permit a more accurate control of structures. The chairman pointed out that the salts had to be removed quickly to avoid corrosion.

* * *

MR. Harmon wondered about the "safety angle" of salt baths. "How do you know that a pot is going, metal or refractory, and where is the salt going?" The first warning is the lowering of the salt level, which would be more than is common by drag out. After that it is taken care of as is well established in industry on molten metals.

* * *

MR. **Janssen** presented his paper on **"Hi-Carbon Wire Drawing"** (Page 764). Mr. Ken Lewis' discussion pointed out that a good uniform structure will flow as nicely in a 30% reduction as in 15%. He doubted whether cups would be produced if a perfectly uniform wire were used; slack patenting produced large pearlite masses which yield with great reluctance. He also wondered if some of the cuppy breaks were not due simply to the fact that angles too small for the job were used and the die friction rose to a point where the wire did not have the tensile strength to pull its own draft. The uniformity of the grain produced in the patenting operation was considered inadequate. He further pointed out that artificial cooling is as well established as the carbide die.

* * *

MR. **Brown**, of Rylands Brothers, considered the microstructure shown most improper for the purpose. He pointed out that in his experience, nine out of ten times lumpiness was associated with welded-up seams, and wondered if the author had considered this point. Further, he had found that the cuppy fracture was associated with segregation to a sufficient degree so that it had nothing to do with drawing. Dr. Janssen indicated that only sound steel had been used. Chairman Smith pointed out that cuppiness was due to other factors than segregation, and Mr. Voigtlander called attention to drafting die angles. A member inquired as to what was a good patented structure, and it was said that it should be a structure free of ferrite and with pearlite which resolves at a magnification above 500. Mr. Spaulding pointed out that in the non-ferrous as in the ferrous field, the flow of metal is restricted at the center. The effect of prior grain size came up for discussion, and it was recalled that some mills drew before patenting. The chairman indicated that the hot-rolled structure played a good part in the draftability. By controlling temperature of reels it is possible to obtain good draftability. Giving a 40% reduction to the green rod, then patenting and drawing to fine wire, was indicated as usual procedure. A member asked what was considered to be good wire rope and what properties were required. It is well known that the customers have been taking anything available lately. This proved to be a lively session with plenty of argument for and against the various controversial points raised by the paper.

* * *

Republic Steel Corp. Plant Visit

SOME 180 members signed up for the visit to the **Wire Mill** of **Republic Steel Corp.** At the mill after being supplied with safety glasses, we were taken in groups of 12 through the plant. There appeared to be plenty of storage space for nails, fence, etc. The nail department was briefly visited; the questions and examination being more detailed in the wire mill, where on the single block machines bundles up to 600# were collected. The coated rods were welded in larger bundles on the take-off yokes. Larger bundles were attempted on the blocks (see talk given by Mr. Brown of England) but the pins broke by fatigue. Single blocks and multiple drawing machines of various makes were examined, and there was considerable interest. We also inspected the bakers in the continuous pickling department, to which the rods are supplied by an endless conveyor system.

* * *

THE forty wire soluble anode electrogalvanizing unit was visited, where the wire enters the electrolytic cell after several cleaning and pickling operations. The wire is annealed previously in molten lead. The electrogalvanized wire was then fabricated into various types of fence.

* * *

Wednesday, October 22, 1947

MR. **Matthew J. Donachie** opened the meeting by calling on **Mr. H. S. Spaulding** to present his paper on **"Wrought Aluminum Alloys, Their Properties, Heat Treatment, and General Characteristics"**, (Page 772). Mr. Spaulding called attention to the change which has been made in the nomenclature on hardness and temper designations of aluminum alloys, which will become effective after the first of the year. These are supposed to be more logical, and make room for new designations.

* * *

THE questions covered corrosion resistance (your correspondent likes to know to what and under what circumstances, facts which do not seem to bother many other people). 56S is not used as aged. In fact, it age-softens, but it may be given a stabilization treatment.

* * *

THE chairman asked if the heat treatment of aluminum wire could not be made in a matter of seconds instead of minutes at the proper temperature. The speaker said it could not, and that good temperature control is necessary at a given temperature. (What's wrong with salt baths?) It was not considered advantageous to use controlled atmospheres in order to avoid formation of a film on wire; thus causing scratching of wire and wear on dies—particularly on fine wires.

* * *

MR. Harmon wondered if the aluminum wire manufacturer used methods such as cleaning of steel wire and shaving of copper wire for operations such as cold heading or upsetting riveted wire where the stress is severe. Difficulties are encountered when seamed wire is made available. A good surface quality is required for enameling fine conductor wire.

* * *

THE next speaker was **Mr. H. L. Alexander,** of DuPont, who presented his paper on **"Cleaning Non-Ferrous Metals with Sodium Hydride".** It was explained that at present there is no sodium available for new business. The various reactions which take place between oxides and NaH were shown. All metals may be descaled by this process which do not react with the base bath, sodium hydroxide, and which are not adversely affected by the temperature of the salt bath 700° F. or more. There is no danger of over treating. Non-ferrous metals which had been tested and found suitable were Inconel, Monel, Nickel, Stellite, in addition to Brass, Bronze, Beryllium Copper and many others. The experiments have been equally successful in a ½ ft. as in a 40-ft. long pot. The salt bath at 700° F. has a specific gravity of 1.8 or 112# per cu. ft. To remove water from the NaOH, sodium monoxide is added. By proper control of the operation only slight explosion will be had, that is avoidance of adding salts, sodium or parts which contain large amounts of moisture, or water. The parts, on removal from the salt bath, must be quenched in water. Considerable steam forms and this, carrying some caustic, is nasty. This part of the installation requires good ventilation. After the quench, many parts may be used as they are. When they are required bright they are given some sort of a dip, depending on the type of metal. Both on ferrous and non-ferrous metals a 10 to 15-min. immersion in the salt bath appears to be necessary; the bright dips in sulfuric acid, sodium cyanide solution, sodium chromate, etc., may require 1 to 5 min. This process causes no hydrogen embrittlement.

* * *

MR. Alexander made a few remarks on costs and said that it is more expensive to descale metals which have heavy layers of oxides, such as low carbon steels, than those which have thinner, although more refractory oxide layers. The cost is over $.50 to $1 per ton. The material used for salt baths and quench tanks is boiler plate or steel.

THE chairman asked about work and health hazards, and Mr. Alexander pointed out that if the unit is properly designed there are no hazards. The only uncomfortable fumes are those over the quench tank, and that can be overcome by building it two times deeper than necessary and using good venting. Only dry work should be put in the molten salt bath.

* * *

MR. **Robert W. Carson** was called on next to present his paper on **"Measuring Diameter of Fine Wire".** He measures to an accuracy of 1% with an electronic instrument. He reviewed the advantages and disadvantages of the various types of diameter-measuring instruments and showed slides. For sizes under .010 in. the problem of measuring diameter accurately becomes progressively more difficult because of uneven anvil pressures. He discussed both physiological and psycological factors affecting measurement. He defined and then compared sensitivity, repeatability and accuracy of the hand micrometer, the barrel micrometer, the dial micrometer and the electronic micrometer; and while for the first it is of the order of .0001 to .0002, for the last it is improved to .000010″ to .000025″. Errors and inaccuracies present in the instrument are too small to be observed on the dial, and everyone who operates the instrument obtains precisely the same readings on the electronic micrometer. He believed it offered a satisfactory answer to the problem of measuring fine wire, and provides an acceptable basis for specifications.

* * *

IN the question period that followed, the maintenance on continuous use was raised and what type of material was used for the anvil. Because of the light pressure there is little wear, and as far as the electronic tubes they have a good life. Approximately 5 years was expected. Mr. Voigtlander asked about cost. Because of the accuracy considerable hand work is required, errors are smaller than can be read on the dial, and at present they sell for approx. $500. If not as much accuracy is needed, some 40% of the cost may be reduced. A member inquired on the range of use, which is about 1/8 in. In wire over .020 in., Mr. Carson believed there would not be any advantage in using this new instrument unless the problem was crucial. Was this only a laboratory type of machine, or could it be used by the wire drawing machine? It can be well used as an "argument settling device". Mr. Donachie wondered about the effect of temperature changes on the instrument. If the change is uniform it is only necessary to recheck the zero and adjust for it. If different parts of the instrument were at different temperatures, some error would be introduced. The latter, however, is not very likely.

* * *

Wednesday, October 22, 1947

AT the Wire Association Luncheon the 1945 Medal award was made to **Mr. M. J. Donachie** for his paper on beryllium copper.

* * *

MR. **F. T. Updike** presented the 1947 Memorial Lecture, the subject being **"Wire in the Automobile Industry".** He pointed out that the lack of wire was not a contributing factor to the delay in automobile production. Wire goes into all essential parts of an automobile to make the riding more comfortable for passengers, for safety purposes and for the peace of mind of the manufacturer. A large tonnage goes into the upholstery. This is high carbon, hard-drawn wire. It also goes into valve springs, of which every car uses 2# quality and its control is of most importance. Before the war, most of them were Swedish. Now little is imported for this use. Music wire is used in many places in a car. Some 200 springs are required in an average car, and there are other uses, such as flat wires and various springs. Flexible shafts, fasteners, bolts, nuts, screws and metal stitching wire are among the products used. Wires are required for the ignition, for controls, generator, starter, etc. Some 300 ft. of insulated wire is used; 8# of copper wire and some stainless steel wire is used

(*Please turn to page* 1001)

LABOR RELATIONS

by John B. Stone,

Washington, D. C.

The eighth in a series of articles on this subject, with particular reference to problems of the wire and wire products industry. The author is a noted authority on the subject.

LEADERS of the American Federation of Labor, the Congress of Industrial Organizations and the larger independent unions mean business when they talk about another substantial pay raise.

* * *

ANY hope on the part of employers, particularly small and medium sized manufacturers, that the absence of a militant demand for pay raises from the agenda of the recent convention in Boston, are being rudely shattered by actions of CIO leaders such as Emil Rieve of the CIO Textile Workers and John Green of the CIO shipbuilding workers. The former has laid detailed plans for a long strike if necessary to enforce wage demands in the South. The latter is doggedly hanging onto his long strike against Bethlehelm and U. S. Steel shipbuilding yards.

* * *

TRUE, neither of these individual unions is involved in wire and wire products manufacture, but observers in Washington are certain that their action is the handwriting on the wall which will be followed by other unions when contracts expire or when the period for reopening of wage clauses comes around.

* * *

SPOKESMEN for the American Federation of Labor, had just formally voiced their demands for another general wage advance when President Truman made his sudden call for a special session of Congress to enact inflation controls at home and the necessary legislative machinery to carry out the Marshall plan for Economic Recovery in Europe.

* * *

PRESIDENT William Green of the AFL was quick to say that demand would be postponed until it was clear what action Congress might take to force down prices.

BUT indications from the White House have made it clear to labor leaders that no drastic price action is planned and the word has gone out from AFL headquarters to proceed with the wage demands. Unions affected by this strategy include all of those organized in the plants of wire products manufacturers.

* * *

THOUGH the CIO and AFL still appear at national headquarters at least, to lose no love for each other, the main structure of their wage strategy is identical. It has been most clearly set forth in the program worked out by Boris Shishkin, chief economist of the AFL.

* * *

THE Shishkin program for leaders to present to employers in demanding wage increases runs like this; Prices have increased substantially since the last general wage increase and show no indication of receeding. The AFL is prepared to submit facts and figures to show that wage increases in the past have not been the cause of inflationary price increases. It is up to management to disprove this claim or submit to another general wage increase without raising prices.

* * *

EXHIBIT "A" in labor's facts and figures to prove that wage increases have not been the cause of price increases in 1946 and 1947 is steel.

* * *

THE Shishkin argument, which is a carbon copy of the CIO brief, asserts that in July, 1947 steel companies increased their prices $5 per ton for finished steel. Steel workers' wages had gone up in the spring and prices of coal and scrap iron were higher. But U. S. Steel shipments alone rose from about 15,000,000 tons in 1946 to an estimated more than 20,000,000 tons in 1947. Because of this increase in production the cost of wages and salaries per ton dropped substantially from 1946 to 1947. In 1946 wage cost was $46.39 per ton. In 1947 it will be only $43.20 per ton—and this after the wage increase.

* * *

THE CIO echoes this "fact and figure" and adds an emphatic underline to U. S. Steel's recent mellon cutting to emphasize the high profits resulting from increased operations despite wage increases. All of which appears to indicate that small employers as well as large, better tune up their economic thinking caps before wage negotiation time comes around.

* * *

ANNOUNCEMENT by Charles E. Wilson of General Electric that his company is dropping the profit sharing plan for workers while continuing it for executives has increased the belicosity in the already tense high councils of the United Electrical, Radio and Machine Workers of America, CIO. The anger is centered against General Electric but the mood is such that it will probably carry over into negotiations with lesser employers.

* * *

THE fact that UE is one of the only three large unions which is continuing its refusal to submit "anti-Communist" affidavits to the National Labor Resistance Board, does not tend to lessen the feeling of beligerence.

(*Please turn to page* 1012)

GOVERNMENT WIRE PRODUCTION INFORMATION

German Wire Straightening Machine

A German machine of ingenious design for straightening wire for producing fishhooks is described briefly in a British report now on sale by the Office of Technical Services, Department of Commerce. An exact straightening is achieved and at the same time a perfect pore free, condensed and highly polished surface is obtained. The machine was made by the firm F. W. Bundgens at Aachen, Germany.

* * *

IN this machine the bar passes between two rotating discs which press against it. Thus the bar receives a fast rotating movement and a forward movement at the same time. The adjustable pressure of these polishing discs causes a condensing and equalizing of the bar. Then the bar moves through three straightening bushings run on roller bearings. The position of the center bushing is adjustable to deflect the rotating bar so it comes out of the machine perfectly straight. The bar then passes between a second pair of polishing discs where it is further condensed and highly polished. It is claimed that bars up to nearly an inch in diameter may be straightened on these machines. The speed of straightening and cutting bars to length for fishing hooks is 300 per minute.

* * *

THE report also briefly describes automatic pointing, barbing, and bending, and discusses machines used in making agate rings for fishing rods. A diagram of the wire straightening machine is included.

* * *

Recovering Iron Sulfate

PROCESSES employed in Germany for recovering iron sulfate from spent pickling liquors are described in detail in a report now on sale by the Office of Technical Services, Department of Commerce. Besides recovering the iron sulfate, the processes check pollution of streams and public water supplies and improve the pickling operation itself, the report states.

* * *

THE report was prepared by George M. Ornsen, consulting sanitary engineer, New York City, following an investigation of the processes in Germany under OTS sponsorship.

* * *

ALTHOUGH the processes were developed primarily to check stream and water supply pollution and recover iron sulfate, experience shows that the processes give more uniform results in pickling operations and require less supervision, according to the report. Above cer-

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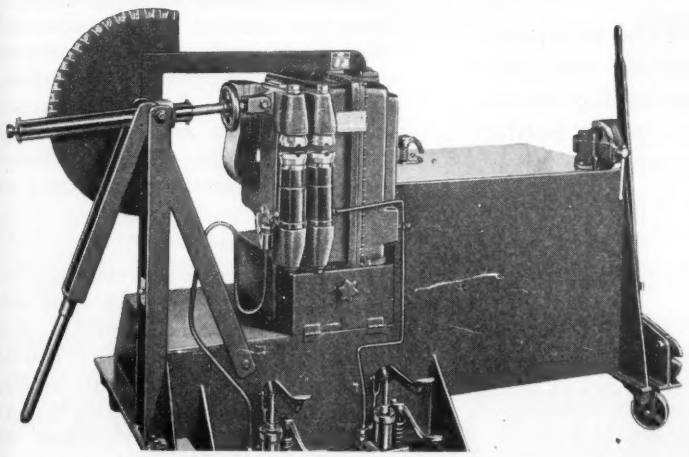
MODEL L-3 MICRO-WELD BUTT WELDER



This type welder is available in three Models (L-1) (L-2) (L-3) for welding COPPER Rods and other non-ferrous metals ranging in size from 5/16" to 7/8" diameter.

The illustration shows the Model L-3 MICRO-WELD Butt welder, equipped with foot operated hydraulic clamping mechanism, radius grooved welding dies and die shoes, and with a single control lever for the spacing operation, and contacting the welding switch.

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tain concentrations the iron sulfate acts as a pickling inhibitor so that lesser quantities of other inhibitors need be used.

* * *

THE several types of pickling and iron sulfate recovery processes are described in detail in the report. Information on equipment and labor required, 11 drawings illustrating machinery and other operational data are included.

* * *

IN German recovery plants in 1941 in which sulfuric acid consumption amounted to 24,875 tons, iron sulfate recovery totalled 15,700 tons, a low rate presumably due to the wartime emphasis on production of essentials rather than byproducts. Mr. Ornsen estimates that over 100 recovery plants have now been ordered or installed in Germany.

* * *

BEFORE the war about 6,000 tons of recovered iron sulfate were sold for agricultural purposes, combating weeds, treating seed grain, killing insect pests, and the like. About 1,200 tons were used as a flocullant for water purification in place of aluminum sulfate. Some was also used in tanning, dyeing, and wood preserving.

* * *

AS in America, the Germans have also treated iron sulfate with ammonia, mainly in aqueous solution, to produce ferric hydroxide and ferric oxide (by chemical precipitation), and ammonium sulfate. The ferric oxide is used as a pigment for paints and as a polishing material in the optical industry. The ammonium sulfate is used as fertilizer.

* * *

THE investigator believes that German experience with iron sulfate recovery in Germany, and other countries as well, "should definitely prove that iron sulfate recovery from spent pickling liquors has passed the stage at which its usefulness should still be doubted. The process, from every viewpoint, has become an established fact, with a sufficient number of advantages in its favor to render its installation worthwhile."

Mixed Steels

THE feasibility of producing "mixed steels" by mixing open hearth or converted steel with acid electric furnace steel to produce a product of specified analysis and physical properties has been definitely established by **Dr. Konrad Hoffman,** metallurgist at the Hermann Goering Works, Watenstedt, Germany, according to a report now on sale by the Office of Technical Services, Department of Commerce. The report was prepared by OTS investigator **Philip L. Getzinger,** a metallurgist formerly employed by the Carnegie Illinois Steel Co., South Chicago, Ill.

* * *

THE purpose of undertaking the production of mixed alloy steels is first, to minimize the loss of alloying elements, and second, to lower the cost of alloy steel by utilizing cheap materials produced in the blast furnace for alloy additions such as spiegeleisen and ferrochromium, according to the report.

* * *

IN the process a chromium charge is produced in the electric furnace without slagging off to recover all of the charged chromium. This heat consists of a full chromium scrap charge to which cheap ferrochromium produced in the blast furnace is added. The phosphorus content of the electric furnace heat is disregarded. At the same time a straight carbon heat is made in a basic open hearth furnace. By slagging off frequently, the carbon heat is finished with phosphorus under 0.01 percent and sulphur under 0.02 percent. Then the electric and open hearth heats are mixed in ratios that give a product of the required final analysis. A similar process may be followed in mixing highly alloyed electric furnace steel with soft blown converter steel of under 0.015 percent phosphorus and under 0.015 per cent sulphur.

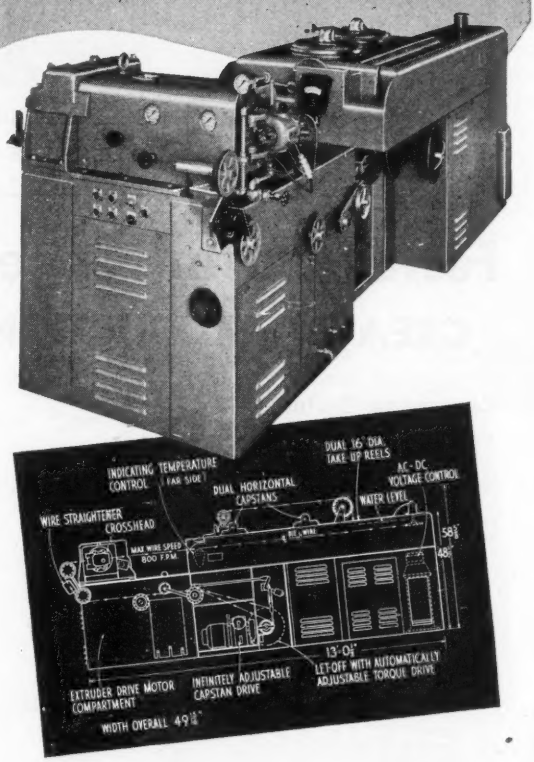
* * *

THE mixed steels produced show an excellent degree of metallurgical cleanliness and satisfactory physical properties, and in general compare favorably with correspond-

COMPLETE PLASTICS

NRM

1½" Wire Covering Unit



CHECK THESE FEATURES

Only 13 feet in over-all length, this compact unit is completely equipped to cover small-gauge wire or cord at high speeds.

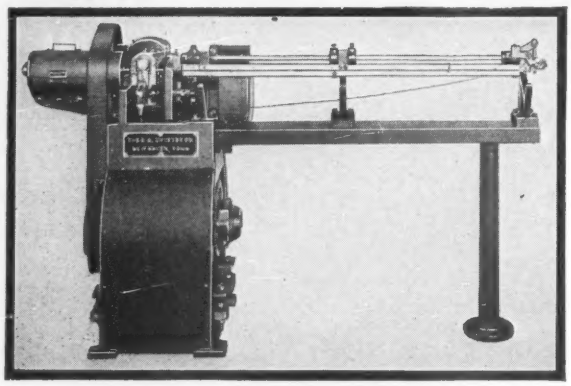
EQUIPMENT:

Double 16" take-ups, water cooling unit with dual, horizontal hauloff capstans, AC-DC voltage control, electric die heater, interchangeable cross-head, herringbone drive to extruder screw.

Write for complete descriptive literature on this and other NRM Plastics Extrusion Equipment.

NRM *Plastics Machinery Division*

NATIONAL RUBBER MACHINERY COMPANY
AKRON 8, OHIO



SHUSTER WIRE STRAIGHTENER TYPE A
Wire Capacity 1/32 – 1/16" Diameter

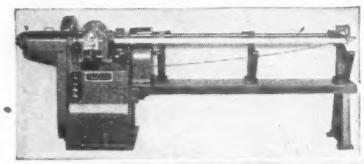
Faster Cutting Speeds

GREATER PRODUCTION!

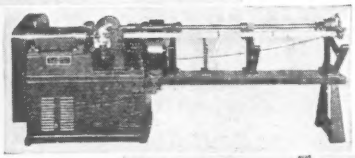
Outstanding Features —

Almost continuous wire travel
Lightning cut-off assures square-cut ends
High speed, direct driven 5-die straightening flier
Quiet, highly efficient V-belt motor drive
Ball and roller bearings throughout
Extremely rigid construction
Fully guaranteed as to material and workmanship.

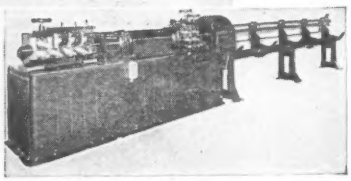
Descriptive folder on request.



Type 1A
1/16" – 3/16"
Dia.



Type 2A
1/8" - 1/4"
Dia.



Type 3A
3/16" - 3/8" Dia.

Type 4A (not shown)
3/8" - 5/8" Dia.

THE F. B. SHUSTER MFG. CO., INC.

3102 Mill River Street

SHUSTER SINCE 1866

Automatic WIRE STRAIGHTENING AND CUTTING MACHINES

ing grades of open hearth and electric furnace steel. Dr. Hoffman believes it is entirely possible to produce stainless steel by the method. The process was 15-25 percent cheaper to use at the Watenstedt Works than standard production methods. About 100,000 tons of mixed steel were produced between April 1943 and December 1944, according to the report.

* * *

THE report (PB-80341; **Production of mixed steels in Germany;** 6 pages, mimeographed, 25 cents) describes plant layout, gives the details of the process, and cites a typical situation for the production of a mixed steel heat.

* * *

ORDERS for the report should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

Can You Top This?

THE writer, **Charles Bontems,** has worked on diamond and alloy dies for thirty-seven years and is still going strong with the Wheeler Insulated Wire Company. Has instructed many men and installed many die departments. Has worked on diamond dies from .00039 to .091 for tungsten, molybdenum, nichrome, copper, etc.

* * *

WOULD you let us know if you have a record of anyone with a longer continuous record, Mr. Bontems would appreciate hearing.

Electric Furnace Company Announcement

THE **Electric Furnace Company** of Salem, Ohio announces the opening of the Michigan District Office at 312 McKerchey Building, 2631 Woodward Avenue, Detroit, 1, Michigan, with **B. C. Thompson,** District Manager in charge.

Outstanding Personalities of the Wire Industry

H. C. Allington
Appointed Gen'l Mgr. of Sales Wickwire-Spencer Steel Div. New York, N. Y.

IT was announced by **Newell H. Orr**, Vice President of The Colo rado Fuel and Iron Corporation, that **Mr. H. C. Allington** has been appointed General Manager of Sales of the Wickwire Spencer Steel Division with offices in New York City.

* * *

MR. **Allington** has been engaged in sales work in the eastern area since the close of World War I when he left the service as an army field clerk. As salesman he opened up New England and Upper New York Territory for a well known gasoline pump manufacturer—later became New York and New England District Manager for the same company. Several years later, the Sharpsville Boiler Works called him to assume a more important position as Eastern District Manager. Soon spotted for his ability, the American Machine and Metals, Inc., called him to New York as Sales Manager of their Oil Products Division and in 1943 Wickwire Spencer Steel weaned him away to manage a new products department but within a few months he was selected Assistant General Sales Manager which position he filled until the present appointment.

* * *

MR. Allington is a member of The Wire Association, the Card Clothing Association, the Buffalo Athletic Club, and retains his membership in the Masonic Bodies of Dansville, New York.

* * *

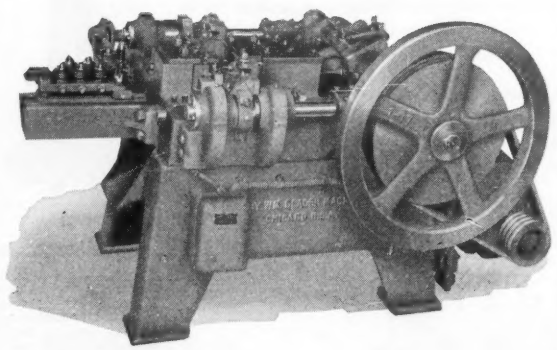
Stewart J. Cort

STEWART **J. Cort**, Vice-President Steel Division Operation **Bethlehem Steel Company**, recently succeeding **Quincy Bent** who retired as Vice President in charge of Steel Divsion Operations, was graduated from Lehigh university in 1906. He obtained early experience in the steel industry with the Cambria Steel Company at Johnstown, Pa. In 1917 he was appointed superintendent of the Saucon Open Hearth Division of the Bethlehem, Pa., plant of Bethlehem Steel Company. In May, 1928 he was made assistant general manager of the Sparrows Point, Md., plant, and in August of the same year was appointed general manager.

* * *

DURING Mr. Cort's 19 years as general manager at Sparrows Point the ingot capacity increased from 1,850,000 net tons to 4,075,000 net tons. The plant during that period had a huge development particular-

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois
Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

ly in the light steels such as flat rolled, wire, and pipe.

* * *

MR. Cort has been active in the Baltimore Association of Commerce, and in various civic and charitable enterprises.

* * *

HIS successor at Sparrows Point will be named at a later date.

J. S. Eskin, General Manager Realock Fence Sales Division Colorado Fuel & Iron Corp.

JACK Eskin spent eight years with the nationally known Cyclone Division of U. S. Steel in Newark, N. J. In June, 1930 he came to **Wickwire Spencer Steel** as a sales correspondent in the department of fence sales. Eight months later he was transferred to New York as Assistant to the Sales Manager of the Fence Department. In January 1939 he was transferred to Buffalo, N. Y., as Sales Manager of Wickwire's Fence Department. On September 1st he was appointed General Manager of Sales Realock Fence Division for Colorado Fuel & Iron Corp. and subsidiaries.

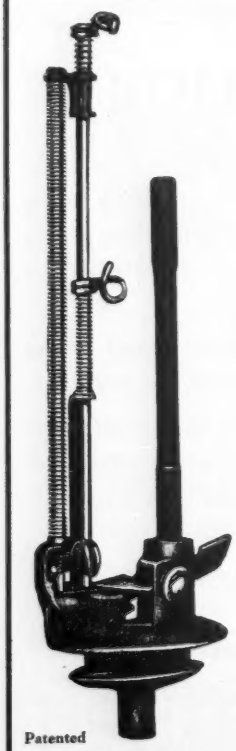
J. S. Eskin, Gen. Mgr., Realock Fence Sales Div., Colorado Fuel & Iron Corp. * * *

E. G. Grace, Chairman of the Board, Bethlehem Steel Corp., Awarded the Charles F. Rand Gold Medal

CLYDE Williams, President of the American Institute of Mining and Metallurgical Engineers, at the dinner of the Metals Divisions recently, announced that the Charles F. Rand Gold Medal had been awarded by unanimous vote of the Board of Directors to **Eugene Gifford Grace**, Chairman of the Board, Bethlehem Steel Corporation, for "distinguished achievement in mining administration".

* * *

FORMER recipients of the Charles F. Rand Gold Medal have been: Robert C. Stanley, 1940, Chairman of the Board, International Nickel Co. (of Canada); Cornelius F. Kelley, 1944, Chairman of the Board, Anaconda Copper Mining Company; and George M. Humphrey, 1947, President of the M. A. Hanna Company, and Chairman of the Board, Pittsburgh Consolidation Coal Company.



Patented

2 BX Mossberg Carrier

MOSSPEED BRAIDER CARRIERS

Represent

Improved Braiding at Lower Costs

The patented MOSSPEED spring tension take-up makes it possible to increase the speed of the maypole-type braiding machine. An effective increase of 80% being obtained in many cases.

The new (x) type MOSSPEED high speed carrier permits the rapid changing of tension springs making this an ideal carrier for braiding all kinds of yarn (cotton, rayon, asbestos, jute), in addition to fine strands of copper wire.

Consult our engineers regarding your braiding problems.

2 SE Copholder

Complete line of both MOSSPEED carriers and metal copholders for all sizes and makes of maypole type braiding machines.

MOSSBERG

Pressed Steel Corp.

Attleboro, Massachusetts, U. S. A.

18 West Street

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

H. A. Grove, Metallurgist Atlantic Steel Co.

H. A. Grove, metallurgical authority on stainless steels and other alloys, has joined the **Atlantic Steel Company.** He comes to Atlantic from Republic Steel which he joined in 1933 as a member of the research department. Since 1936 he has been mill metallurgist on alloy flat products, specializing on stainless steel sheet and strip production. While at Republic he served as instructor in metallurgy at the University of Akron evening school for six years.

* * *

DURING the war Mr. Grove devoted most of his time to tank and light armor plate, and served as assistant director of the Super Alloy Branch of the Steel Division of W.P.B.

* * *

HE is a member of the stainless steel technical committee of the American Iron and Steel Institute, has served as chairman on several sub-committees on stainless steel for the American Society of Testing Materials, and is a member of the American Society for Metals.

* * *

MR. Grove graduated in Metallurgical Engineering from Ohio State University, and was then employed by the Aluminum Company of America at the work at Alcoa, Tennessee from 1929 to 1931. Following this he was associated with Battelle Memorial Institute, Columbus, Ohio.

* * *

Western Electric Appointments

STANLEY Bracken, executive vice president, **Western Electric Co.,** New York, has been elected president to succeed Clarence G. Stoll on his recent retirement. Mr. Stoll has served as president of the company since 1940, and his retirement brings to a close a career of more than 44 years with Western Electric. Mr. Bracken has been associated with the company for 35 years. He had been president of Teletype Corp., a Western Electric subsidiary, which post he resigned in 1941 to become general manager of manufacturing of Western Electric, and a director of the company. He became vice president in 1942 and executive vice president in 1947.

* * *

Charles F. R. Jones

FOLLOWING an illness of over three weeks, **Charles F. R. Jones,** of Westmount, died recently in his 72nd year. Mr. Jones was formerly manager of the wire and cable division of the Northern Elec-

WEAN EQUIPMENT Corporation

THE WEAN EQUIPMENT CORPORATION are recognized as specialists in high-efficiency strip and wire mill equipment.

COLD ROLLING MACHINERY

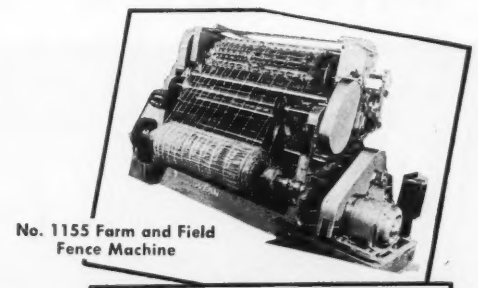
For 36" Wide Material and Narrower

MILLS · REELS · SLITTERS · LEVELERS
COILERS · EDGERS · SCALE BREAKERS · SHEARS
SCRAP BAILERS · CONTINUOUS PICKLING

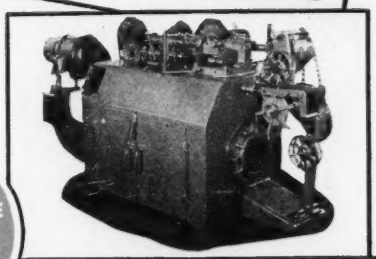
WIRE MILL EQUIPMENT

PATENTING GALVANIZING AND TINNING TAKE-UP FRAMES
WIRE FLATTENING · SPOOLERS
NAIL GALVANIZING AND BLUEING FIELD FENCE
and BARBED WIRE MACHINES

WEAN EQUIPMENT CORPORATION
22800 LAKELAND BLVD · CLEVELAND, OHIO

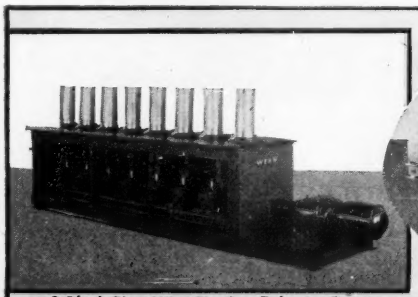


No. 1155 Farm and Field Fence Machine

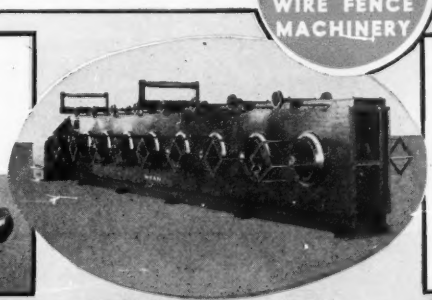


HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY

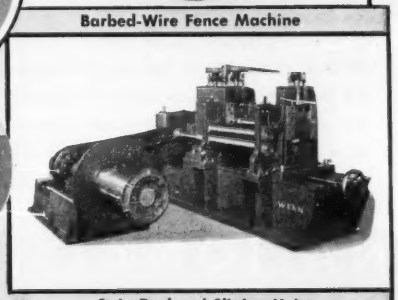
Barbed-Wire Fence Machine



8 Block Fine Wire Tinning Take-up Frame



16 Block Wire Galvanizing Frame



Strip Reel and Slitting Unit

tric Company, and was widely known for many years in the electrical and communication trades in Canada. On completion of over 45 years service with the company, he retired on pension in June, 1946.

* * *

BORN in Quebec City on May 22, 1876. He was educated at the Quebec High School and became associated with Northern Electric Company, upon its formation in January, 1914 as wire & cable sales manager and rose to be manager of that department in 1939.

* * *

Vernon Royle

IT is with regret that we announce the death of **Vernon Royle**, formerly President of John Royle & Sons, Paterson, N. J.

* * *

VERNON Royle was born in Paterson, New Jersey, on July 10, 1877. He attended the public

Vernon Royle, former President of John Royle & Sons, Paterson, N. J. * * *

elementary and high schools and entered the employ of **John Royle and Sons** to acquire practical shop experience. Two years later, he entered Stevens Institute and was graduated with an M. E. degree. Further studies were pursued and Mr. Royle received a diploma on completion of a course on metallurgy.

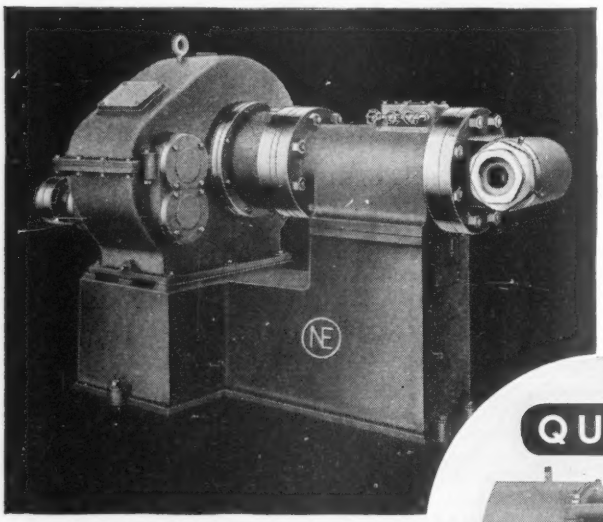
* * *

FOLLOWING his father's death in 1934 Vernon Royle assumed the Presidency of the company. He held this position until illness forced his retirement in 1940.

* * *

Stuart M. Jones Elected President Insect Wire Screening Bureau

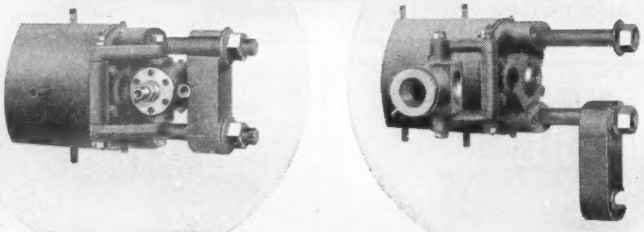
STUART M. Jones, sales manager of New York Wire Cloth Company, has been elected president of the **Insect Wire Screening Bureau. Herman J. Blaser,** vice-president of Keystone Wire Cloth Company, Hanover, Pa., and of its parent corporation Seneca Wire and Manufacturing Company, Fostoria, Ohio, has been named vice president. **Ralph W. Bacon** of New York continues as secretary.



NE TUBERS *adaptable to*

variety of products. Illustrated at left is a 4½" NE tuber equipped with cross-feed flanged-type head for insulating wire, extruding hose covering, special shapes or tubing. With slight modifications, either rubber or plastics can be handled.

QUICK CHANGE HEAD



NE Quick Change Head Unit permits swinging Die Head out, for cleaning, inspection or changing. Just loosen 2 bolts. This feature illustrated on a 3½" NE Tuber is available on all sizes thru 6".

NATIONAL-ERIE CORPORATION

ERIE, PA. U. S. A.

A Review of Recent Wire Patents

No. 2,428,362, MEANS FOR RECOVERING COATING MATERIAL FROM MELTED ELECTROLYTICALLY COATED CONTINUOUS STRIP MATERIAL, patented October 7, 1947 by Klaus Egge, Mount Lebanon, Pa., assignor to Carnegie-Illinois Steel Corporation, a corporation of New Jersey.

An inclined trough is so disposed, in a quenching tank, with reference to a horizontally rotatable roll over which the coated strip material passes and the path of the quenching fluid under pressure, that excess coating material or scale is forced from the space between the strip and roll and drops into the trough.

* * *

No. 2,428,364, PROCESS FOR PROVIDING RUST FREE SURFACES ON FERROUS METAL PARTS, patented October 7, 1947 by Max Frager, Philadelphia, Pa.

The process comprises subjecting the parts to an aqueous rust removing solution of ammonium citrate, washing this solution from the parts, submerging the parts in a dilute aqueous solution of sodium nitrite, transferring the parts to a soluble oil emulsion containing an emulsifying agent so that the water on the parts is displaced by this oil, removing the excess of emulsion adhering to the parts, and then evaporating the water.

* * *

No. 2,428,804, COPPER CLEANING COMPOSITION, patented October 14, 1947 by Esther M. Terry, Drexell Hill, and Morris Kaplan, Philadelphia, Pa.

This composition comprises approximately 5 parts by weight sulphuric acid, 4½ parts 30% hydrogen peroxide, 3 parts acetic acid, and 87½ parts water.

* * *

No. 2,429,222, METHOD OF MAKING CONTACT WIRES, patented October 21, 1947 by Robert A. Ehrhardt, New Providence, and Robert G. Humphrey, Madison, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

In preparing contact wire for point-contact translators, the inventors move a length of the wire (as tungsten) continuously at a uniform rate, immerse the wire in an electrically energizing bath containing an etching agent with the wire made the anode in the bath, then immerse the moving wire for a predetermined interval in an electrolytic bath including a nickel compound and an acid for cleaning the wire and giving it a thin initial adherent plating of nickel with the wire made the cathode in the electrolytic bath, immerse the initially plated moving wire for a predetermined longer interval in an electrolytic nickel plating bath for depositing thereon a plating of nickel, immerse the moving wire for a still longer predetermined interval in an electrolytic gold plating bath for depositing on the nickel plating a plating of gold of substantial thickness, and subject the plated wire to a heat treatment sufficient to cause a diffusion of the initial nickel plating into the tungsten body of the wire and only a partial diffusion between the outer plating of gold and the plating of nickel.

* * *

No. 2,429,611, CABLE STRIPPING DEVICE, patented October 28, 1947 by Frank J. Churnell, Bloomfield, N. J., assignor to Federal Telephone and Radio Corporation, New York, N. Y., a corporation of Delaware.

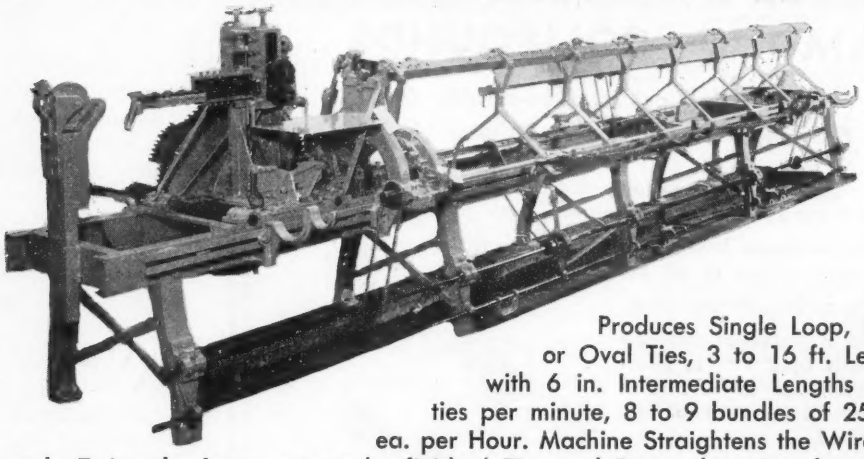
A pair of slotted wheels guide the uncut cable into the path of a knife having its free end inserted into and beyond the adjacent part of at least one slot.

* * *

No. 2,429,635, APPLICATION OF INSULATING MATERIAL TO ELECTRIC CABLES, patented October 28, 1947 by Alan Julian Maddock, London, England, assignor to Standard Telephones and Cables Limited, London, England, a British Company.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

MAKE STEEL WIRE BALE TIES WITH THIS REMARKABLE MACHINE



Produces Single Loop, Round or Oval Ties, 3 to 16 ft. Lengths, with 6 in. Intermediate Lengths — 37 ties per minute, 8 to 9 bundles of 250 ties ea. per Hour. Machine Straightens the Wire, cuts it to length, Twists the Loop, counts the finished Ties and Drops them into bundles of 250 Wires. Equipped for tight-and-loose pulley drive.

Send For Prices & Particulars.

REED and RICHARDS TRANSATLANTIC, Inc.

CHANIN BLDG., 122 EAST 42nd ST., NEW YORK 17, N. Y., U.S.A.
REG. CABLE ADD.: "LOUREED, NEW YORK".

Also: STAPLE CUTTING MACHINES MAKING FENCE & POULTRY NETTING STAPLES

This invention covers a tool for winding tape onto a cable and comprises a high-frequency generator, a tape-spool carrier mounted on a bracket adapted to engage the periphery of the cable under which bracket the tape from the spool is fed onto the cable, an electrical connection from one output terminal of the generator to the bracket and a lead from the other output terminal of the generator for making electrical connection to a metallic interior part of the cable.

* * *

No. 2,429,870, APPARATUS FOR COATING WIRE AND THE LIKE, patented October 28, 1947 by Walter G. Dahlstrom, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

There is disclosed a die having a vertical opening through which the coated wire passes. The die has an enlarged portion providing a float and this float is contained in a vessel provided with a liquid medium in which the portion floats, so that the die is floatably supported during use.

Patent Numbers Correction

CORRECTION has just been received in this office of two Patent numbers listed in the September, 1947 Review of Wire Patents.

* * *

DUE to a clerical error in the material received for publication numbers 2,323,301 and 2,324,382 were incorrected given and should read 2,423,301 and 2,424,382 respectively. See page 682 of the September issue.

* * *

New "Alumitel" Telephone Conductor Wire

THE **Nichols Wire & Steel Co.** of Davenport, Iowa, announces the availability of an aluminum alloy No. 12 B. W. G. (0.109" Dia.) wire processed for use in telephone and telegraph service.

* * *

KNOWN as **"Alumitel"** (pat. applied) this conductor wire is rust-proof and highly resistant to attack by sulphur fumes generally encountered along railroad right-of-ways. Because of its lightness it is easy to work with and workmen can handle more footage at one time. **"Alumitel"** has a direct current resistance of approximately ⅓ that of galvanized iron per loop mile of circuit. It compares favorably and in most instances advantageously in price with copper clad steel wire, galvanized iron wire and copper wire.

* * *

THE use of aluminum for electrical service is not new. There are approximately 1,500,000 miles of aluminum electrical conductor wire in exposed service in the country today. Aluminum has the Underwriters' approval for electrical house wiring, and its use for this purpose is rapidly increasing.

* * *

"ALUMITEL" has been field tested by **Nichols** and found to perform very satisfactorily. It is furnished in ½ mile paper wrapped coils and available for immediate delivery. Wth every coil is included an instruction sheet giving sag tables and other pertinent data. Also available is soft **"Alumitel"** Tie Wire, made in 0.109" Dia. (12 B. W. G.). Packed 300—18" pieces to a carton. For additional details and prices write direct to Nichols Wire & Steel Co., Davenport, Iowa.

In Your Die Room Use

HYPREZ

DIAMOND COMPOUNDS

For Flawless Polish on Tungsten-carbide Dies
For Economy — For Reliable, Uniform Finish

Precision-graded, clean, virgin diamond powder — in perfect mixture — accurately graded, fast cutting.

Patented compound base that does not fly off tool or die—stable and uniform at all normal temperatures.

Produces perfect, lasting polish.

Supplied in dust-proof cartridge and sturdy applicator to eliminate waste; or in substantial container for conventional use, if preferred.

A scientifically balanced product to match your finishing skill.

Ask For Demonstration

Representatives in All Principal Manufacturing Areas

HYPREZ DIVISION
ENGIS EQUIPMENT COMPANY
431 SOUTH DEARBORN STREET • CHICAGO 5, ILLINOIS, U. S. A.

Measuring Diameter of Fine Wire

(*Continued from page* 971)

Micrometer, shown in Fig. 7, the work-holding function is separate from measurement, allowing selection of predetermined anvil pressures from ¼ oz. to 2 lb. As usually supplied for wire measurement, anvils are ⅛ in. diameter. An anvil pressure of 2 oz. is sufficient to take the cast out of cold drawn .010 in. wire held between the anvils and still be safe for measuring .002 in. soft copper wire without danger of permanent deformation. For wire diameters under .002 in. the anvil pressure is reduced to ¼ oz. which keeps the work pressure safe for wire as small as .0005 in. diameter.

* * *

HOW this is accomplished is shown by the section drawing Fig. 8. With no work between the anvils, dial is set to zero by rotating the micrometer spindle until it contacts the ball on top of the upper anvil. When this contact is made, an electronic circuit responds and a lamp in the base of the instrument is lighted. An unusual characteristic of this circuit is that no current flows across the contact, so no pitting or arcing occurs when contacts are opened. As a result, the electronic circuit gives a positive response for a movement of only five millionths of an inch at the contacts and indicates contact before the micrometer screw produces any pressure on the anvil.

* * *

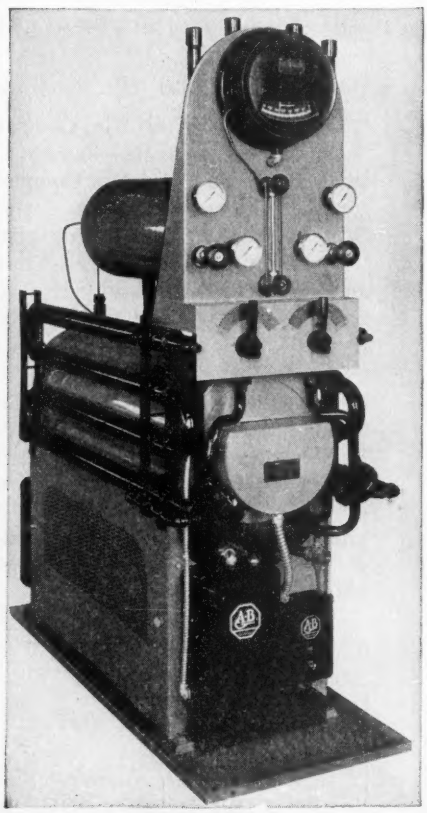
IN preparation for a measurement the dial is set at a reading slightly greater than the work, and anvils opened by retracting the lower anvil. Wire is inserted and the lower anvil released. As the lower anvil comes against its stop, the upper anvil is lifted by an amount equal to the diameter of the wire placed between the anvils. Then, the distance the upper anvil is lifted is measured by rotating the micrometer screw.

* * *

WORK pressure is controlled entirely by the upper anvil spring and by inserting springs of the proper strength, any work pressure from ¼ oz. to 32 oz. can be selected. Springs are calibrated and readily changed when necessary. Thus measuring pressure is held constant to well within 5 per cent, and is completely out of control by the operator.

TABLE C

	Sensitivity	Repeatability	Accuracy
Hand micrometer	.0001	.0002	.0002
Barrel micrometer	.0001	.0001	.0001
Dial micrometer	.00005	.00005	.00005
Electronic micrometer	.000010	.000015	.000025



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ANVILS are lapped flat and parallel to 20 millionths of an inch. The lower anvil is so designed that it returns to its seat with no more than 10 millionths deviation, and the instrument frame is sufficiently rigid that loads placed on the frame in normal use cause no observable difference in dial reading.

* * *

MICROMETER screw is 40-pitch, or .025 in. per revolution, as for a hand micrometer, and pitch errors are held to a maximum of 25 millionths of an inch. The dial, Fig. 9, has 250 graduations, or one for each .0001 in. Divisions are spaced .037 in. apart, and are white lines on a black background. Dial settings are easily read to ¼ division.

* * *

SENSITIVITY, repeatability and accuracy of the Electronic Micrometer as compared with the other measuring instruments discussed are: (See Table C)

* * *

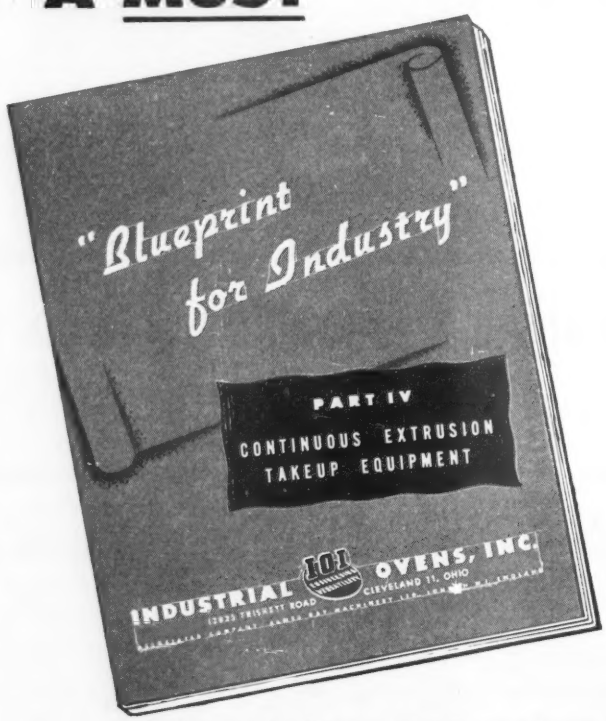
NOW going back to our requirement of 1 per cent accuracy, the Electronic Micrometer will qualify for wire diameters as small as .0025 in. and it will measure .001 in. wire with an accuracy of 4 per cent. With ⅛ in. anvils a measuring force of 2 oz. is safe for soft wire .002 in. diameter; with ¼ oz. for wire less than .001 in. These anvil pressures are sufficiently low for measurement of enamelled or insulated wire with the same accuracy as for bare wire. Out-of-round is measured by rotating the wire between the anvils and reading the dial at high and low positions. Operation is so nearly the same as for a hand micrometer that no special instructions are needed for inserting the work, setting to contact or reading the dial. Zero is readily set as accurately as the dial can be read by adjusting position of the index. Errors and inaccuracies present in the instrument are too small to be observed on the dial, and everyone who operates the instrument obtains precisely the same reading.

* * *

EITHER as a shop measuring instrument or as a laboratory standard the Electronic Micrometer therefore offers a satisfactory answer to the problem of measuring fine wire, and provides an acceptable basis for specification.

* * *

A MUST



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Hartley Tool and Die Company

THE **Hartley Wire Die Company** announces a change in name to the **Hartley Tool and Die Company.**

* * *

THE word "Wire" is being eliminated from the company name and the word "Tool" added to give better presentation of the firm's expanded development.

* * *

THE policy of the owner management will be to maintain the high quality of all products bearing the "Hartley" name and to draw on long experience and finest engineering skill in the development of these products to meet current and future production needs.

SEND IN
YOUR ORDER NOW
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1947 WIRE BUYERS GUIDE

1,325 New Sizes of Talide Metal For Wear-Resistant Applications

THE **Metal Carbides Corporation**, Youngstown, Ohio, announces the publication of a new eight-page catalog #47-WM, dated September 1, 1947 covering complete prices and specifications on Talide Metal for wear-resistant applications. Included in this catalog are 1,325 different sizes of standard solid Tungsten Carbide blanks, bars, strips, rods, tubes, bushings, rings, flats, tips, discs and shapes which are carried in stock for immediate shipment. This is the first time in the carbide industry that any company has offered such a large quantity and variety of standard carbide shapes for wear-resistant purposes, and it standardizes carbide shapes similar to the manner in which steel bars, strips and rods are offered. The standards established herein should prove of great value to both fabricators and users of carbide metal for resisting wear and abrasion on tools, machinery and equipment. Metal Carbides Corporation produces both sintered carbide and hot pressed carbide, and their processes permit the manufacture of longer strips and larger rings than made by any other carbide producer here or abroad.

* * *

Stiff Arm Electric Hoist Facilities Spotting to Close Tolerances

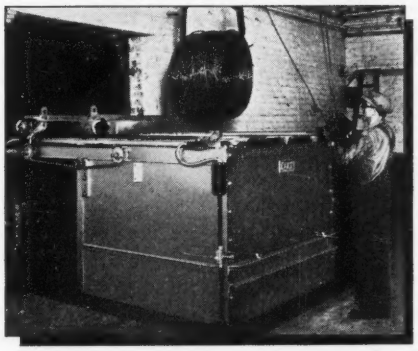
A specialized electric cable hoist has been developed by **Yale & Towne** specifically for "wire stripping" in the steel mill—but also has usefulness in other fields where the use of a stiff arm for manual spotting to close tolerance is important. The stiff arm is ruggedly built so that it can be used laterally to push a bridge-beam or jib (on which the hoist may be mounted-, as well as to push the hoist itself in the transverse direction.

* * *

THE hoist is offered in four capacities (500, 750, 1000, and 1500 lbs.). Various lifting speeds and lifting heights are available, and the equipment requires only 15¼" headroom. Hoisting and lowering is by push button control from the end of the stiff arm. Other features of the hoist include: weatherproofed electrical circuits; dust-tight motor construction; one point oiling through a single reservoir; chrome nickel steel gearing; limit switches to restrict hoisting and lowering within desired ranges; a self-actuating motor brake to control motor "drift" and permit exceptionally close inching of cable and hook (this brake having sufficient power to hold full load if necessary); and a self-cooling main lead brake independent of power supply. An interesting refinement is a swinging idler sheave to permit maximum cable pull and reduce cable chafing even if the load is out of line with the overhead beam.

SPEEDY, SCALE-FREE WIRE ANNEALING

★



Unique Ajax Electric Salt Bath Method provides fast, scale-free production—without decarburization. Cuts operating costs—greatly increases pot-life!

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Added advantages in this modern, proved annealing method are—less floor space required, less labor, low maintenance cost, shorter time cycles (rarely over 20 minutes), no atmosphere equipment, no scaling, no explosion hazard. This modern electric salt bath annealing by the famous immersed electrode internal heating principle is ideal for annealing low carbon, high carbon and stainless steel wire and rod—in gauges from .020" to .250". Or for annealing aluminum, and copper and silver alloys. Also for descaling stainless and alloy steel wires in molten caustic soda. Recently developed salt mixtures greatly lower the cost of these operations. Interesting case-histories are available. Write for list of users.

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Steel Cable as Intricate as Watch Makes Magnetic Oil Prospecting Possible

THE slow, onerous job of the oil and mineral prospector, riding with a week's kit on his trusty burro, is listed as one more casualty of the war. In his place is the naval war veteran who was largely responsible for clearing the seas of Axis submarines—the magnetometer, or "aerial doodlebug"—a complicated device which looks like a 100-pound bomb suspended by special cable from an airplane.

THE airborne detector, containing a mechanism which was one of the war's most closely guarded secrets, is even now prospecting for oil and minerals in American tidewaters and has proved of special value in surveys of polar regions, jungles and large swampy areas. Already it has made possible the geological mapping of more than 40,000 square miles in this country and Alaska, including parts of the Naval Petroleum Reserve areas.

* * *

SCIENTISTS regard the magnetometer as a vital key to hidden natural resources and hope i prove decisively that the U States has not, as some have lagged to a "have-not" rati the raw materials of the ea Suspended by its strong, intrica cable, this detector prepares a quic large-scale and continuous surve of geological formations for the guidance of follow-up ground crews.

* * *

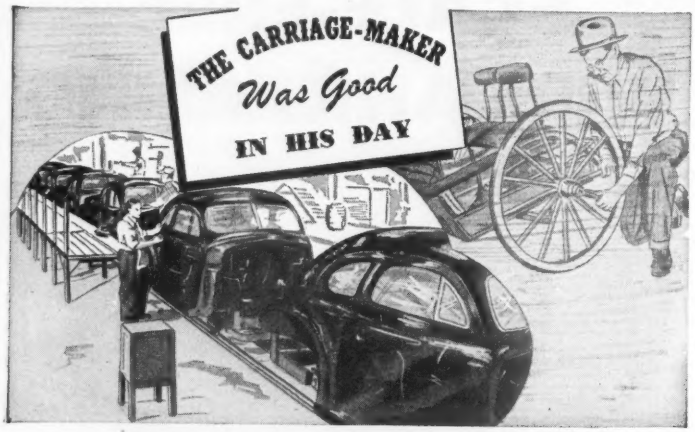
ESSENTIAL accessories to these scientific indicators, which are being used today above, on and below the surface of the earth, are the unique electrical wires and cables manufactured by the electrical cable division of **American Steel & Wire Company** at **Worcester, Mass.** The steel wire-drawing, wire rope manufacturing an cable-making departments of th **United States Steel Corporation** subsidiary have each had their part in building strong, armored cables as intricate as a watch.

* * *

THESE cables are used with the magnetometer above the earth to make a rapid survey for oil or minerals. They are also used in surface prospecting for subsurface geological structures. In this case they are connected to seismometers, such as are commonly used for detecting earthquakes, and carry to recording machines impulses set up by small charges of dynamite exploded in the earth and reflected to the surface by subsurface strata. Correlation of these impulses by time sequences gives the geologist a picture of the earth hundreds and even thousands of feet below him and influences his decision whethe or not the expensive operation o drilling should be tried.

* * *

DEEP in the ground these oil well cables also have many varied and interesting applications. One of the most important uses is in connection with "logging," or making a record of conditions inside a drill hole. Several types of logs of an oil well may be made. When the hole is uncased, as in an uncompleted well, electric logs are made by an instrument lowered gradually to the bottom of the hole



His slow—painstaking—hand craftmanship—would be swamped in these days of production line mechanization. In the iron and steel industry, equally advanced methods have been developed—and

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...smitting to the surface a ...f the electrical characteris... ...the various strata encoun... ...this way, oil-bearing sands ...located and producing levels ...rmined. Another type of logging, ...wn as the "thermal log," pro... ...es a temperature record of the ...tire well which yields valuable ...ological information.

* * *

...N older wells which are cased ...and running dry, it is often likely ...hat oil-bearing sands have been by... ...assed and no records kept. In such ...ases a radioactive or 'neutron log" ...employed. By this method a pic... ...re of the strata outside the steel ...asing is obtained and new produc... ...g area determined. In all these ...ep logging operations, special ca... ...s combining electrical conductors ...d strong steel armor are required. ...lready wells have been logged ...depths in excess of 3 miles and ...ill deeper wells, using similar ca... ...le in the logging operation, are ...anned in the future.

* * *

ANOTHER interesting use for oil well cables is "gun perforation". When it has been determined from the log of a well that oil sands have been reached, drilling is stopped and the well is cased with steel tubing cemented in place. At this point a horizontal firing gun is lowered to the oil-bearing area, as determined by the log. The casing is perforated with steel bullets fired in all directions by electrical impulse transmitted from the surface by the supporting cable.

* * *

STILL another use for oil well cables is with instruments designed to determine the direction in which a well is being drilled. Since wells seldom go straight down, the location of the bottom with respect to the top is important, especially if the well is near the boundary of a lease or property. Further uses of oil well cable include short and long-time bottom hole pressure and temperature recording, water locating and torpedo firing.

* * *

MOST oil well surveyors have standardized on a type of cable which consists of electrical conductors and insulation as a core, protected by a steel covering that provides great strength. This cable is armored with round wire applied in two layers in opposite directions about the core, so that any tendency to twist is minimized.

* * *

CABLE of this type range from 1/8 inch up to 7/8 inch in diameter and carry from one to six electrical conductors, depending on service required. The strength of the steel armor in all cases is sufficient to support more than 20,000 feet of cable with a reasonable factor of safety.

* * *

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New Consulting and Research Organization Foresees High-strength Heat-resisting Powder Metal Parts

A new corporation devoted to consultation, research and developement in the field of powder metallurgy—**Sintercast Corporation of America,** New York City—has been formed by **Erwin Loewy,** president of Hydropress, Inc., and two associates, **Dr. Claus G. Goetzel** and **John Ellis.** The new organization offers to industry a means of applying the latest techniques and newest developments in the rapidly-complicating field of powder metal parts production. Sintercast is currently establishing complete research and pilot-production facilities, so that it can carry clients' projects through laboratory development to full-scale production.

* * *

LOEWY, president of the new group, is well known both here and abroad in the heavy hydraulic-press and metalworking-machinery fields, and heads up companies which in the past 25 years have made important contributions to both non-ferrous and ferrous extrusion, forging and rolling, and die casting processes. **Dr. Goetzel,** vice president and director of research, has worked and written profusely in the fields of powder metallurgy and infiltration technology. He originated, and still directs, the Powder Metallurgy courses at New York University—and was formerly associated as technical director with American Electro Metal Corp. **Ellis,** chief engineer, has specialized for many years in the equipment-design, production-procedure and sales-engineering phases of powder metal parts production. He has formerly been on the staffs of both Hydropress and American Electro Metal Corporation.

* * *

SINTERCAST expects its most active fields of service to embrace: (1) the development of materials with unusual heat and corrosion resistant properties, (2) the evolution of processes and special equipment for manufacturing such materials, (3) the exploitation of new opportunities in the field of infiltration (casting one alloy into all the interstices and voids of sintered skeletons of other alloys), (4) the design and setting up of powder metal parts production departments for manufacturing firms, and (5) general consultation to help clients utilize up-to-date powder metallurgy to its fullest. Sintercast will even design a plant for powder metal parts manufacture, supervise its construction, and manage it until it is operating smoothly.

* * *

Booklet Describes Process Of Making Glass Fibers

AN interesting booklet describing the process by which "Vitron" glass fibers are made by Glass Fibers, Inc., Waterville, Ohio, has been made available to those of our readers who would like a copy. It covers this company's fiber drawing technique and the role played by electronics in production controls.

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Winsted Division, Hudson Wire Company Expands

EXPANSION plans of the Hudson Wire Company, Winsted Division, call for the construction of a 60 by 60 foot addition to the firm's present factory building, and it has been revealed that a contract for its erection has already been awarded.

* * *

THE addition, necessary due to the recent expansion of the company's business, will be used as a wire-drawing room. The structure will be one story, 14 feet high, with a dome-type roof of steel construction.

* * *

Highlights of the Wire Association Convention

(*Continued from page* 983)

for windshield wiper parts, wire shields around spark plugs. ½# of bead wire per tire is used on pneumatic tires to make them cushions of air. They require maximum fatigue resistance with good adhesion to rubber. A new development is the use of fine wire (.0059") instead of nylon or cotton in tires, especially the 7" x 3" tires. At present they are used on heavy-duty and aircraft, trucks, etc. only. The cost of drawing and fabricating is too high. When it is lowered there will be a good market for this product. The former first-class user of wire of fine wire, for spokes for wheels has been displaced. Mr. Updike estimates that the total amount of drawn wire in an automobile is some 180 pounds per car.

* * *

MR. J. S. Kemp, of the Armour Research Foundation, was invited to make a demonstration of the **Magnetic Wire Recorder.** He pointed out that in the victrola type of sound recorder the ground noise is almost of the same level as the actual sound. In 1890 a recording magnetic system, dependent on high moving velocity, high carbon steel wire, was invented. In 1930 a young student at the University of Illinois, whose cousin was a singer who wanted better recording, studied this problem. Before the war the

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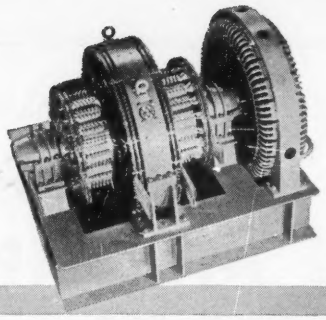

FEATURES built into H-VW-M generators qualify them for many types of service, appeal alike to electroplaters, anodizers, electrotypers, producers of electrolytic chemicals, metal refiners. Among these features are:

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The Trauwood Process, new in principle, eliminates high temperature furnaces and lead pots with their excessive maintenance costs and low thermal efficiencies. More positive temperature control is possible and quenching is done in a RISING temperature—instead of falling, as in conventional heat treating methods. The rapid rate of heating (4 to 5 times as fast as furnace heating) increases production and uniformly produces a finer grained product with higher physical and fatigue values.

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Complete details of the Trauwood Process will be furnished you on request. Our engineers will help you solve your continuous wire and strip patenting, tempering, and annealing problems. Write today.

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Navy also became interested in it. At the present time some 43 organizations are licensed to make this wire recorder, although only 6 are in the market. The parts are esesntially 3; the mechanical system to move the wire at a uniform speed, the amplifier which picks up sound and transforms it to electric impulses, and viceversa, and last the recording part, which imprints the record on the wire or wipes it off at will.

* * *

MR. Kemp gave demonstrations of the use of the wire recorder, and how he could talk forward and backward, wipe off and correct mistakes, and the type of sound that is available from recorded music, all to the delight of the audience. These showed the possibilities as a dictation machine. It can also be used to record telephone conversations.

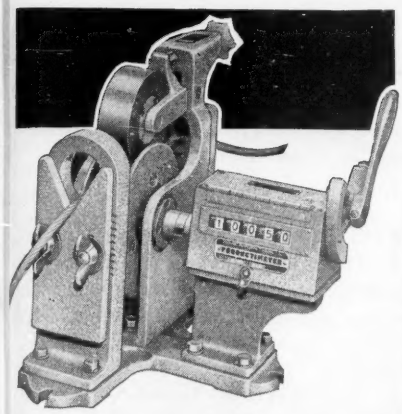
* * *

HE stressed the importance of new research and development on wire. At one time medium carbon wire was used, but it rusted. As they went over to stainless steel they had to redesign the recording and amplifying systems. Some of the problems, as far as wire are concerned, were listed as: avoiding the trainsfer from one strand of wire to the next, since this would cause a noise. This has been overcome. Perfect magnetic characteristics are needed to avoid distortion. The wire has to be erased easily. That is, the wire should not retain sound. The diameter must be uniform, and the magnetic characteristics must be uniform. In conclusion, he indicated that all the parts of the wire recorder were in a more advanced stage of perfection than the wire itself.

* * *

HE mentioned the new work being done with magnetic recording, such as applying magnetic sound on tape (cellulose or other) on 16 and 8 mm film which may enlarge the field of amateur movies. The .004 in. wire is passed thru the recorder at 2 ft per sec., and some 7500 ft. are required for an hour program.

* * *



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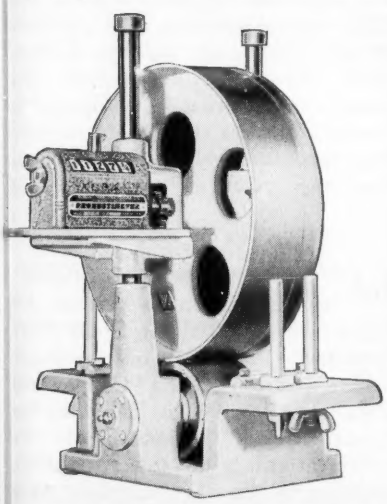

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THESE two parts of the program gave much material for discussion to the members present, and through that evening, one could hear discussions on the amount of fine wire, .0059 in. which the tire industry could absorb, improvements that can be made on magnetic recording wire, and who should sponsor or enter such business.

* * *

Thursday, October 23, 1947

"THE **Fabrication of Tungsten Wire**" was presented by Mr. Jack W. Forbes, (Page 767). He pointed out that this is a business for which you need not be crazy to be in it, but it helps. He presented the many uses of tungsten, although they are in the small tonnage class. Tungsten is one of the few metals which are processed practically in the pure state. Tungsten, above .020 in, rod must be formed hot, as it is very brittle. At smaller sizes it becomes ductile, which is about the reverse to that which happens to steel. For drawing tungsten, graphite suspended in water is used to protect the material from oxidation.

* * *

MR. Edinga pointed out the differences between steel and tungsten. Mr. Hammon speculated on pure metals and their properties versus the effect of very small amounts of impurities. Perhaps they should preferably be called alloying elements, because of their strong effect on the properties. He also inquired on the effect of recrystallization temperature, and effect of possible additives to tungsten to improve the ductility of .060 in. tungsten rod.

* * *

MR. Schein replied that the ductility is a function of cold work. The recrystallization temperature is approximately ⅓ the melting temperature. As for other metals that would be 1800° C. For smaller wires it comes down to some 1250° C.

* * *

ONE member wondered if the out-of-roundness was measured for these tungsten wires, and what effect it would have on end use. The wire is annealed to brittle,

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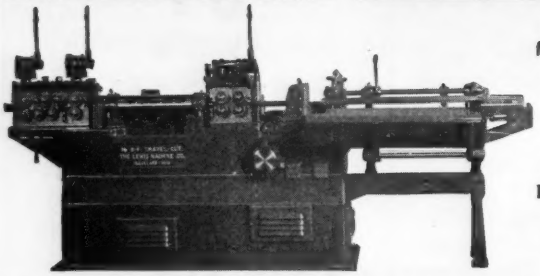

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broken and examined microscopically. Tungsten is drawn to .0003 in. wire. To make finer wires it is etched and .00018 in. and possibly finer wires may be made. The drawing is done in single pass dies.

* * *

THE last item on the program on Thursday morning was the **Symposium on Foreign Wire,** for which some 16 papers were available. Mr. Edinga called first on **Mr. C. P. Short** to read **Mr. Doering's** paper on the **"Ferrous Industry in Canada"** (Page 789). **Mr. Rolle** presented a paper prepared by **Mr. O. Semler,** on the Australian Wire Industry, which was started only in 1911 and by 1937 had a capacity of some 160,000 tons of rods. The outlook is that their industry is in a favorable position to supply the fairly large home market. Their prices are rather lower than world market levels. They expect to supply some requirements of New Zealand and the Eastern countries.

* * *

MR. Gill remarked that he was not talking about the American Indian, but of the Indian Indian before reading his paper on the Wire Industry in India, (Page 795). Dr. Morral was called to present the South American situation, represented by a paper on Chile, by J. L. Carrasco, (Page 790). He gave, instead, some figures on the cost of the steel facilities which are expected to be complete by 1952 for Argentina 100 million dollars, Chile 53 million dollars. Peru gave no information, and Brazil's addition of 30 million dollars to complete their plans to produce eventually 1 million tons of steel per year.

* * *

MR. **R. S. Brown,** of England, was called on to present his paper on the **"British Steel Wire Industry"** (Page 783) and the paper by Mr. Preston on the **"Copper and Copper Alloy Wire Industry in Great Britain",** (Page 785). He called attention to the production increase in the wire industry since the introduction of the tungsten carbide die in 1931. At the present time both in ferrous and non-fer-

rous industry there is a high production level. He mentioned the British Iron and Steel Association made up of practical wire men and academic interests, the program of research, simplification of ferrous and non-ferrous specifications and other activities.

* * *

MR. Brown concluded that he was happy to see that the Wire Association had become the international representative of the wire industry by organizing a symposium such as he had witnessed.

* * *

OTHER papers prepared for this symposium were mentioned by name only: Belgium, by A. Boddaert and F. Rentjens (Page 782); the Non-Ferrous Wire and Cable Industry in Canada, by H. D. Short (Page 788); Czechoslovakia, by O. Semler; Germany, reports by H. Hermann and summaries from various PB reports and others (Page 791); Ireland, by F. O. Neill (Page 852); Scotland (Page 846). Spain was reported on by R. Quijano (Page 797); South Africa's steel wire industry was taken from a report in Foreign Commerce Weekly, (Page 798), and Sweden was reported by G. Svensson (Page 799).

* * *

DR. Morral, in his final comments, remarked on the large demand for rods, both here and abroad, the desire of most countries to become self sufficient, and which have recently started to set up steel mills and their own wire industry. He stated that competition should be keen and the future should depend on economics, quality and improvements derived from research and development.

* * *

THIS concluded the technical sessions of a congress which attempted to cover the improvements of the last ten years. The production of wires from one of the lightest metals, aluminum, to the heaviest, tungsten, covering in passing steel somewhat extensively. Data on the wire industry of this country as well as that of some 14 other countries was presented.

* * *

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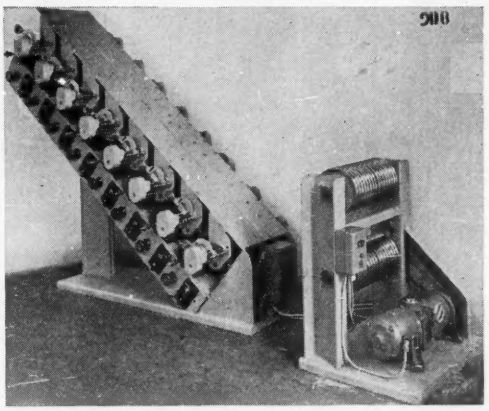

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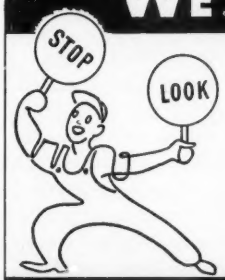

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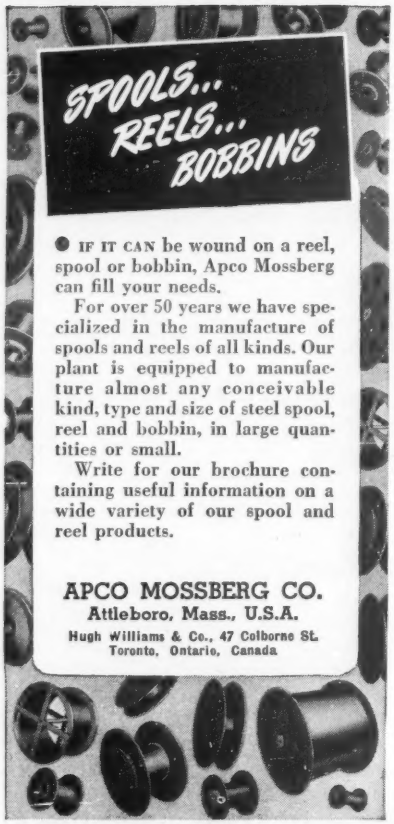
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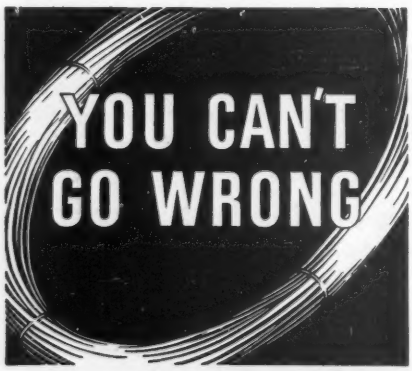

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Thursday P. M. Plant Visit

APPROXIMATELY 90 members boarded the busses which took the party to the **Hawthorne Works** of the Western Electric Company Incorporated. There, after being issued safety glasses, members were taken through the Rod and Wire Mill and Cable Manufacture in groups of six. The trip through the Rod Mill started with the billet heating furnace from which the group saw the bars rolled through the five pass roughing mill, the five pass intermediate mill and finally through the four pass finishing mill, from which the quarter inch copper rod was taken up on the coilers at approximately 15* hundred feet per minute. The pickling, washing and final dipping in soap solution was then witnessed prior to transporting rod to the drawing machines.

* * *

THE cold drawing operations were performed on three sizes of machines, which were producing wire from 14 to 40 gage. The range in speeds was 2,000 feet per minute on the heavy wire to 3,000 feet per minute on the fine wire units. The final operation of annealing cable wire into continuous electrically heated furnaces using burned gas for inert atmosphere was observed.

* * *

THE second portion of the trip through Cable Manufacture showed how paper is wound around bare copper wire for insulation in telephone cables. Equipment was also observed for the latest method of insulating copper wire with paper pulp, which largely has replaced the paper tape method. A comparison of these two operations is an example of the efforts of industry to more efficiently produce product through improved manufacturing methods. The twisting of the paper insulated wire into pairs and the subsequent stranding of the pairs

* **The time between furnace discharge to coiling takes approximately1 ¼ minutes. The correspondent recalls a previous visit of some ten years ago, and it was noted that less physical effort is currently required in the Rod Mill.**

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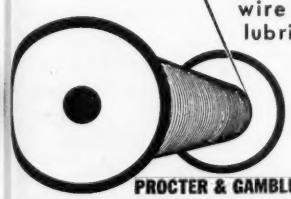

PROCTER & GAMBLE, CINCINNATI

into large and small cables, and the final operaton of bunching the smaller cables into larger units was observed. The covering of the cable with lead sheath, inspection and the lagging of the cable reels on large special machines was observed prior to the final shipment of cable.

* * *

AFTER a few stragglers were finally loaded into the busses, the party returned to the hotel. This interesting plant visit closed the activities of the 1947 convention of the Wire Association.

* * *

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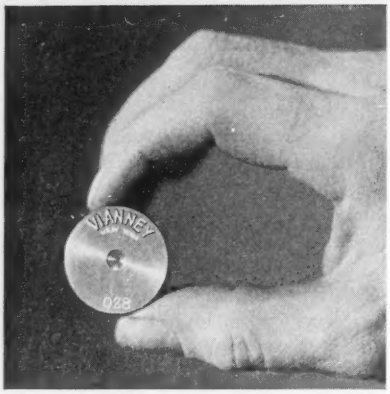

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(*Continued from page* 978)

he was heartily welcomed and made night superintendent. He died about five years ago.

* * *

WHILE **Worcester Wire Works** was at its peak, **Oscar Johnson** fell ill of pernicious anemia. He was obliged to quit work, and retired to his farm in New Hampshire, where he died. Before his death he confided to **Dave** that he was convinced that **Dave** would lose the mill. There was a provision in the by-laws regarding the replacement of a director which he had never considered before. **Dave** took the papers to a lawyer and was told that his father was right. **Oscar Johnson** died; the directors met, the vacancy was filled, strictly in accordance with the by-laws, and control shifted from the technical to the financial partners. The **Johnson boys** were assured that there would be no change in the relationships, that their work was thoroughly appreciated and would always be rewarded on a scale to which they could take no exception, and so on, and so on. But **Johnsons** are stubborn people. They had had a taste of control, and nothing short of control was thinkable. They put their heads together, there were three of them then, **George** having got out of school, and decided to get out.

* * *

TO get out and start another mill meant, by the terms of the agreement, disposing of all their stock. Everywhere they turned to sell the stock, they found that their plan to start a competing wire mill was ahead of them. At long last they found a speculator who was prepared to take it over at about ten percent of its actual value. Before I pass on I will finish up the **Worcester Wire Works.** The financial partners secured a good

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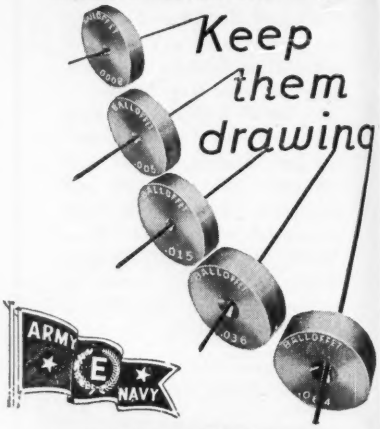

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man to run the mill, **Albert Kenworthy,** an **American Steel & Wire** man with experience at North Works and at Trenton. He was succeeded in turn by **Arthur Carlson,** a **Spencer Wire** man, who later went to **Washburn Wire Co.,** by **K. D. Smith** and by **George Palmer,** another **Spencer Wire** graduate, while for a long term **Percy Andrews,** formerly of Wire Village, and later with **John Wheeldon,** took care of all soft wire matters. He retired a year or two ago, and is living in Spencer. The present manager is **Mr. Mooney.** The owners sold the plant, some years ago, to **National Standard Co.** of Niles Michigan, largest factor in the tire bead market, and it is generally understood that they were well pleased with the price.

* * *

THE **Johnson** boys retired to Dave's cottage on Cape Cod, where it is assumed they fished and swam and snorted around in high speed coveyances until the strain of recent events had subsided, and then they consulted as to ways and means. There was not the slightest question as to what they were going to do, merely the need to agree on details. The main question was whether they should start on the hen-house level, spending meagerly and always holding out cash enough to get them out of any imaginable jam, or whether they should spend what they had, and trust to their business experience to keep afloat. This time it was Dave, the conservative, who said "shoot the works." He had had enough hen-house; he had started two successful mills, and thought he ought to know his way. Furthermore, **Dave** was getting to be well known around the country; the W.W.W situation was common knowledge, and there were several flattering offers being held open for him. He told the boys, if we bust we wont stay around here to be laughed at, we'll head for the Pacific Coast; There's jobs waiting for us there where we can make another stake.

* * *

THEY shot the works, but in a discreet way. There was no reck-

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less spending. I was a salesman of wire mill equipment in those days, and I speak from experience. The first thing they bought was a machine shop, in which they settled down and quietly built, their own machinery. They bought land on Wiser Avenue. It was about this time that **George Peace** came into the picture. He was a Canadian, from **Laidlaw's** in Hamilton, and he had useful contacts in the tire wire market; he is now in charge of the Akron branch of **Johnson Steel & Wire Co.** The **Johnson** boys finally went out to the Pacific Coast, but it was not to make another stake, but to establish the Los Angeles branch, which **George Johnson** now manages.

* * *

THE **Johnson story**, as you all know, had a happy ending. There were plenty of sleepless nights, more than once the thing seemed to be stuck on dead center, all the boys have silver hairs that didn't come from lying in the hammock sipping a silver fizz, but at least they got rolling. The plant has been enlarged and rebuilt too many times to mention.

* * *

IT is extremely unlikely that young **Dave Johnson**, hunched over his text books in the dust and roar of the mill, making a living with one hand and educating himself with the other, ever stopped to realize that he was one of a vanishing race, the industrial pioneers, or ever dreamed that his enterprise was so antisocial in character that within a single generation it would be outlawed by a whole series of laws and directives and become punishable in a bewildering number of ways. If he had ever been told, for instance, that in order to plow back the earnings into the business he would be obliged to declare them, so the Treasury could take a bite, then distribute them to himself on the books so the Treasury could take a second bite, and then issue more stock and sell it to himself, he would have dismissed the tale as too fantastic for belief.

* * *

NOR could he have foreseen that working two shifts and making more wire than had ever been made before would subject him to

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having his ears beaten off by a Goon Squad from the C.I.O., and his employer to a series of involvements with Washington bureaus too hideous to contemplate. How could he have built up his original stake in a market where margin trading was forbidden? Or how, if he had had the cash to finance the deals, could he have managed the quick turnovers and escaped with enough tax-free profit to pay for his time?

* * *

FOR that matter, would he have been permitted to be earning a living in the mill at that tender age? As for the hen-house, keystone of the **Johnson** enterprises, could he have built it without disclosing, in his application for a certificate of—oh well, why pursue a painful subject? But it makes a man stop and think, when he realizes what a single generation has brought about, and wonder what new technique can possibly be worked out to permit the legal establishment of new enterprises in the traditional American way.

* * *

THE name **Johnson** is one of the best known in wire circles in this country and in many of the countries of Europe. It is a name that is spoken not merely with respect but even with awe. It inspires in a wire man the feeling that the impossible, if it ever happens, is more than likely to happen right here.

* * *

THERE is still a lot of tire wire in the **Johnson** output, as the Akron branch would indicate, but I hear there is a trend away from it to a certain degree, a trend toward more diversity in the high grade products. I believe there are no clouds on the **Johnson** horizon at the moment, except for that ever-present and menacing cloud whose long-range implications are so disturbing to the non-integrated mill, the rod shortage.

* * *

I had reached the preceding paragraph and paused to frame up a hopeful ending when the radio broadcast the news of the purchase of **Johnson Steel & Wire Co.** by **Pittsburgh Steel Co.** There's your happy ending; the rod shortage is over.

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Labor Relations

(*Continued from page 984*)

THE strange fact that UE which is generally known as a left wing or "Communist dominated" union and Phil Murray's right wing United Steel Workers of America are the only big CIO unions wholeheartedly defying the NLRB on the affidavit union and are joined in this defiance by John L. Lewis' United Mine Workers of the AFL, has implications that don't at first reveal their full significance.

* * *

LEADERS of all three are aware that their failure to qualify for NLRB elections may lead to raiding of their ranks by other unions, both AFL and CIO, which have submitted the affidavits and which therefore qualify for places on NLRB election ballots.

* * *

LEWIS has his district fifty catch all, which he can use in any counter-raiding operation. Murray's Steelworkers include many laborers who are in activities far removed from steel. They too can do counter raiding. UE already has stripped for action in case anybody tries to take advantage of their status with the NLRB.

* * *

WHAT it all adds up to is a picture of possible jurisdictional confusion in which the small manufacturer may be holding the bag if he doesn't conduct his labor relations with care.

* * *

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Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

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Standard Industrial Compounds Co., Chicago, Ill.

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Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
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Union Wire Die Corp., New York, N. Y.
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DIES—Diamond
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New England Wire Die Co., Worcester, Mass.
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Vianney Wire Die Wks., New York, N. Y.
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Eastern Tungsten Carbide Co., Newark, N. J.
Wayne Wire Die Co., Hillside, N. J.
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Ajax Industrial Supplies Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
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Metal Carbides Corp., Youngstown, O.
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Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

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Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
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Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

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Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Michigan Wire Die Co., Detroit, Mich.
Millbury Die Co., Millbury, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Tungsten Alloy Mfg. Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIRECT ELECTRIC RESISTANCE HEATING—
Trauwood Engr. Co., Cleveland, Ohio.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro. Mass.

DRYING & PRE-HEATING ROOMS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.
Syer, C. Raymond, Westport, Conn.

WHERE TO BUY, Continued

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros., & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Hayes C. I., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel & Carbide Co., McKees port, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Hayes, C. I., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corporation, Toledo, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Hanson-Van Winkle-Munning Co., Matawan, N.J.

GAVANIZING FLUXES—
Hanson-Van Winkle-Munning Co., Matawan, N.J.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of Cleveland.
Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Crepe-Kraft Co., Newark, N. J.
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, O.
Standard Varnish Wks., Staten Island, N. Y.
Warren Thread Wks., W., The, New York, N.Y.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKees port, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Ironsides Co., The, Columbus, Ohio.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.
Swift & Company, Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bale Tie
Reed & Richards Transatlantic Inc., New York, N.Y

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Laribee Machine Co., Chicago, Ill.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Entwistle, Jas. L. Co., Pawtucket, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Laribee Machine Co., Inc., Camden, N. Y.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery Inc., Pawtucket, R. I.

MACHINERY—Cold Heading
Ajax Manufacturing Co., Cleveland, Ohio.

MACHINERY—Copper Wire Drawing and Rolling
Aetna Standard Eng'g Co., The, Youngstown, O.
American Insulating Mach'y Co., Phila., Pa.
Laribee Machine Co., Inc., Camden, N. Y.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Ajax Manufacturing Co., Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Inc., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Porter, H. K. Inc., Everett, Mass.
Shuster, F. B. Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKees port, Pa.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Aetna Standard Eng'g Co., The, Youngstown, O.
Ajax Manufacturing Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Laribee Machine Co., Inc., Camden, N. Y.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
National Erie Corp., Erie, Pa.
National Rubbey Machinery Co., Akron, Ohio.
Robertson John, Co., Brooklyn, N. Y.
Rovle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N.Y.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Reed & Richards Transatlantic Inc., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

WHERE TO BUY, Continued

MACHINERY—Galvanizing
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail, Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Pointing
Aetna Standard Eng'g Co., The, Youngstown, O.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach' Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
National Rubber Machinery Co., Akron, O.

MACHINERY—Rubber for Insulating Wire
National Rubber Machinery Co., Akron, O.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Erie Corporation, Erie, Pa.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd Charles P., Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Laribee Machine Co., Inc., Camden, N. Y.
National Mach'y Exch. (Used), New York, N.Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach' Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Reed & Richards Transatlantic, Inc., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Ajax Manufacturing Co., Cleveland, O.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
Laribee Machine Co., Inc., Camden, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Erie Corp., Erie, Pa.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Laribee Machine Co., Inc., Camden, N. Y.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Laribee Machine Co., Inc., Camden, N. Y.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila, Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
National Erie Corp., Erie, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila, Pa.
Boyd Charles P., Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Laribee Machine Co., Inc., Camden, N. Y.
Moslo Machinery Co., Cleveland, Ohio.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna Standard Eng'g Co., The, Youngstown, O.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
Aetna Standard Eng'g Co., The, Youngstown, O.
Ajax Manufasturing Co., Cleveland, Ohio.
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Laribee Machine Co., Inc., Camden, N. Y.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Procter & Gamble, Cincinnati, Ohio.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

WHERE TO BUY, Continued

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Ceilcote, Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I

POTS—Lacquer
Industrial Ovens, Inc., Cleveland Ohio.

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Industrial Ovens, Inc., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Boyd, Charles P., Corp., Philadelphia, Pa.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Camden, N. Y.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Hazardville, Conn.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wooden
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
American Rolling Mill Co., The, Middletown, O.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Younstown, O.

ROLL STRAIGHTENERS
Moslo Machinery Co., Cleveland, Ohio.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Heil Process Equipment Corp., Cleveland, Ohio.
Standard Industrial Compounds Co., Chicago, Ill.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
American Rolling Mills, Middletown, Ohio.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Protecr & Gamble, Cincinnati, Ohio.
Swift & Company, Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp.,

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPRINGS—Tools for Forming
State Machine Tool Co., Hartford, Conn.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
American Rolling Mills, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.

TANK—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Penna.

TOOLS—Spring Forming
State Machine Tool Co., Hartford, Conn.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

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TREADS—Safety
Norton Co., Worcester, Mass.

TUBE BENDERS AND FORMERS—
Ruesch, H. J. Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y. Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Rolling Mills, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Corp., Dobbs Ferry, N.Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
American Rolling Mills, Middletown, Ohio.
American Steel & Wre Co., Cleveland-Chicago & New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's. John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., of Colorado Fuel & Iron Corp., Buffalo, N.Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Nickel & Nickel Alloy
International Nickel Co., Inc., New York, N.Y.

WIRE—Music
Ecca Machine Corp., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Anchor Wire Corp., Jamaica, N. Y.
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
American Rolling Mills, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago-New York.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
American Rolling Mill Co., Middletown, Ohio.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.
W. Warren Thread Co., The, New York, N. Y.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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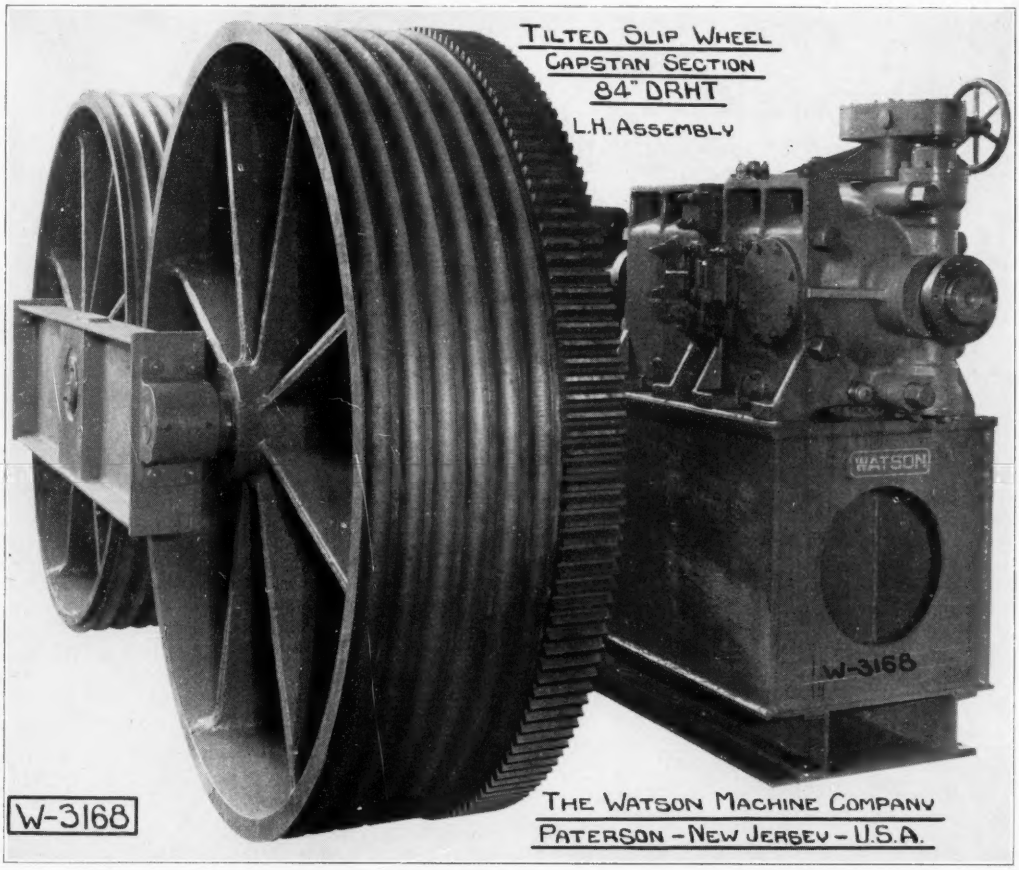

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